THE
METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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Foundrymen Meet in Chicago

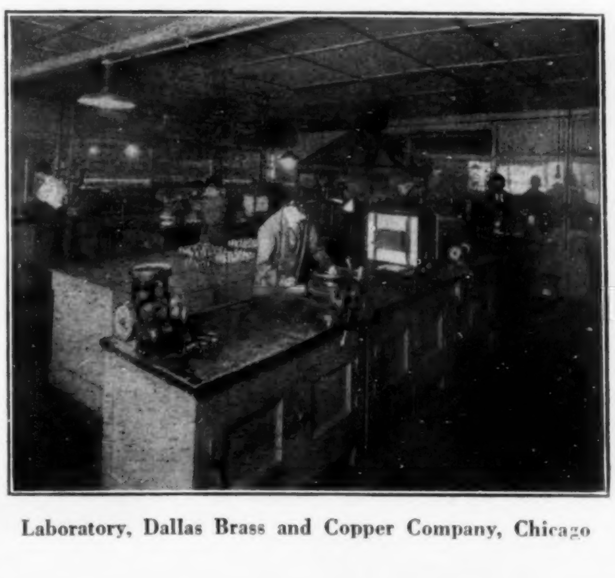
Exhibition and Wide Variety of Plants in Chicago Make an Interesting Convention—Non-Ferrous Men Well Represented—Foundry Practice, Costs and Equipment Discussed

THE American Foundrymen's Association held its meetings, in Chicago, Ill., at the Stevens Hotel, as we went to press, during the week of April 8th.

Chicago is an eminently suitable city for holding such meetings, as it is one of the important centers for the production of metal products. Being the second largest city in the United States, and in close contact with an immensely populous and prosperous area, it has built up an enormous volume of manufacturing. A glance at the following list of a number of Chicago concerns who fabricate or use non-ferrous metals, will give an idea of the size of this industry.

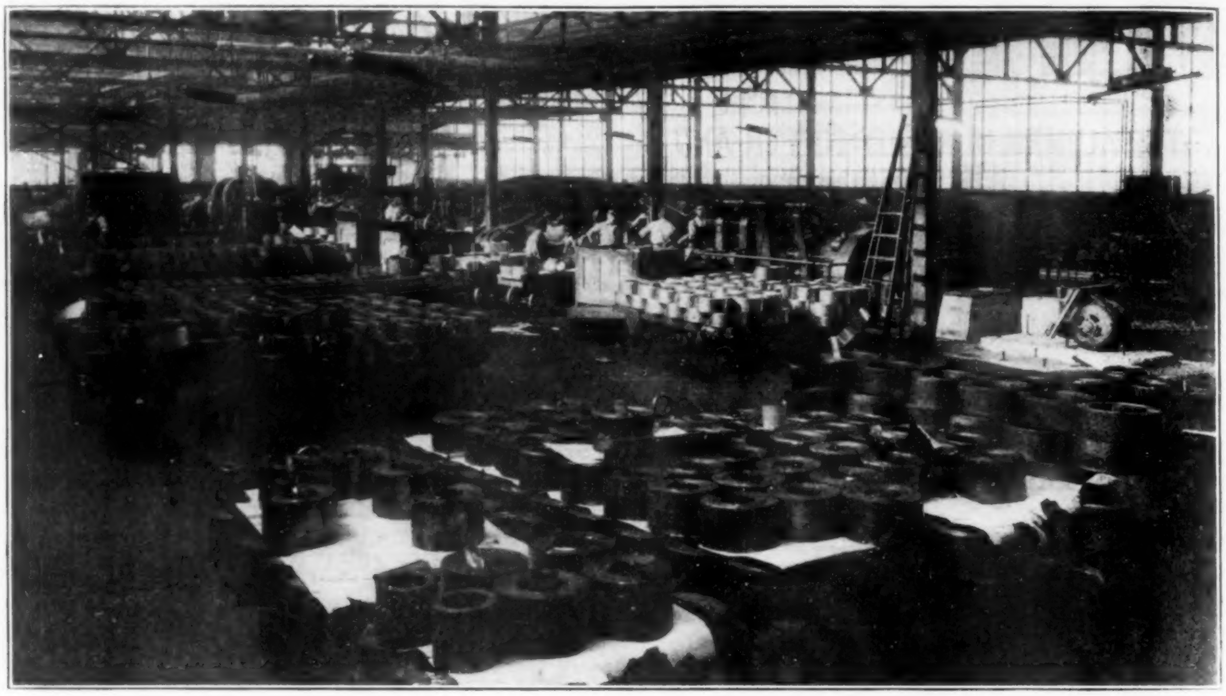
ALEMITE MANUFACTURING COMPANY. Castings, etc.
ALLEN MANUFACTURING COMPANY, W. D. Hose and garden supply manufacturers, etc.
ANCO MANUFACTURING COMPANY. Store fronts.
ATLAS COPPER AND BRASS MANUFACTURING COMPANY. Coppersmiths, castings, etc.
BRUNSWICK-BALKE COLLENDER COMPANY. Motors and radio.
CHAMPION MANUFACTURING COMPANY. Brass screws and bolts, manufacturers.
CLAYTON MARK MANUFACTURING COMPANY. Pumps, castings, etc.
DIENER MANUFACTURING COMPANY, GEO. W. Fire extinguishers, etc.
ECONOMY FUSE MANUFACTURING COMPANY. Fuses.
EDISON ELECTRIC APPLIANCE COMPANY. Electric appliances.
FEDERATED METALS CORPORATION. Ingot brass.
GREENDUCK COMPANY. Stampings, badges, etc.
GRIGSBY-GRUNOW COMPANY. Radios.
HARRIS AND COMPANY, ARTHUR. Coppersmiths.
HODGSON FOUNDRY COMPANY. Brass foundry.
IRON MOUNTAIN COMPANY. Iceless refrigerators.
JUSTRITE MANUFACTURING COMPANY. Miners' lamps, etc.
KELLOGG SWITCHBOARD AND SUPPLY COMPANY. Radio and telephones.
MANZ CORPORATION. Rotogravure work, etc.
NOBLE AND COMPANY, F. H. Stampings and manufacturing jewelers, etc.
PARAGON ELECTRIC COMPANY. Electrical manufacturers.
PASCAL SYLVESTER. Terrazzo strips.
QUADRIGA MANUFACTURING COMPANY. Washers, stampings, etc.
RELIABLE ELECTRIC COMPANY. Wire connectors, etc.
RUSSELL ELECTRIC COMPANY. Electrical apparatus and appliances.
RYAN AND COMPANY, J. J. Brass foundry.
SCHOLL MANUFACTURING COMPANY. Manufacturers arch supporters.
SHAKEPROOF LOCK WASHER COMPANY. Lock washers.
SILVER MARSHALL COMPANY. Radios.
STANDARD PROCESS CORPORATION. Rotogravure copper cylinders.
STEWART-WARNER SPEEDOMETER COMPANY. Radios, etc.
VICTOR MANUFACTURING AND GASKET COMPANY. Gaskets.
WEBER BROS. METAL WORKS. Stampings, spinnings, etc.
WOLFF COMPANY. Manufacturers plumbing supplies.

Special attention is often called to the growth of the Dallas Brass and Copper Company which was recently merged with the Republic Brass Corporation. This company was originally organized in 1908 under the name of A. C. Dallas and Son, Inc., assuming mill connections as a selling agent for several mills. Later, the name was changed to the Dallas Brass and Copper Company. In



Laboratory, Dallas Brass and Copper Company, Chicago

1912 the company started to manufacture some of its own products, such as thin brass, copper strip and lock-steam tubing. The business grew steadily and in 1925 it was necessary to add a tract of 24 acres of land at 6600 West Grand Avenue. By 1926 a modern brass mill had been installed and put into operation. Electric furnaces are used in the casting shop and operations are laboratory controlled. A new copper mill was added in 1928.

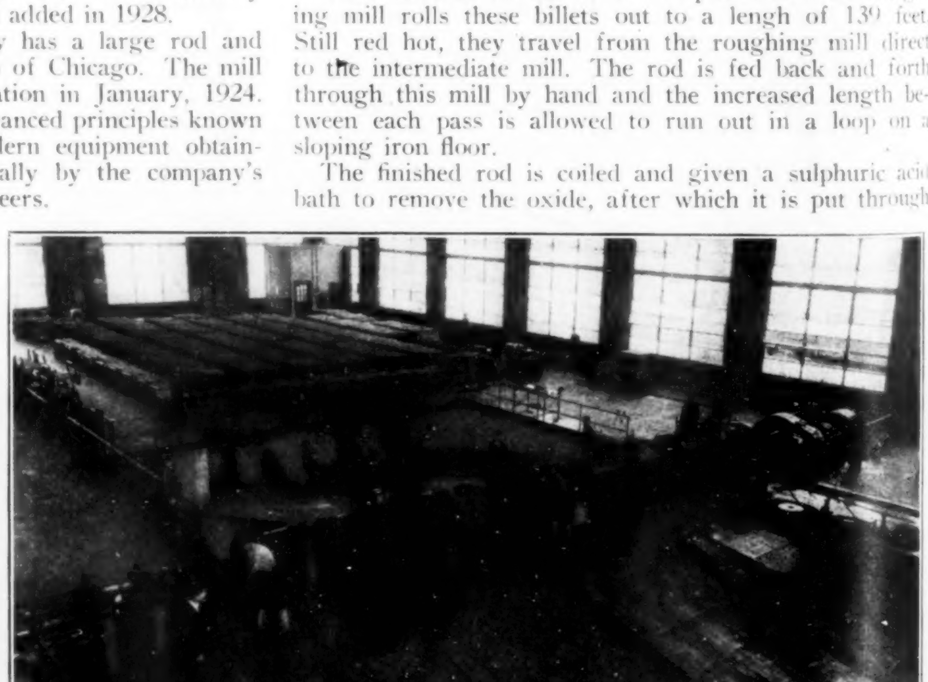


Section of Rolling Mill, Dallas Brass and Copper Company

The Western Electric Company has a large rod and wire mill in Hawthorne, a suburb of Chicago. The mill was completed and put into operation in January, 1924. It was constructed on the most advanced principles known and equipped with the most modern equipment obtainable, much of it designed especially by the company's manufacturing development engineers.

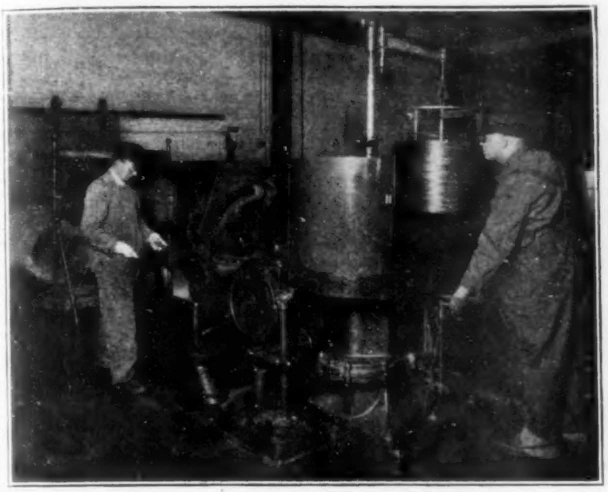
The process of milling copper rod and drawing copper wire used at Hawthorne are the same in principle as those used in other American mills. Copper billets four inches square and 54 inches long are the raw material. They are heated to a temperature of 1,800 degrees in a large recuperative furnace, which is loaded at one end and unloaded at the other. A five-pass automatic roughing mill rolls these billets out to a lengh of 139 feet. Still red hot, they travel from the roughing mill direct to the intermediate mill. The rod is fed back and forth through this mill by hand and the increased length between each pass is allowed to run out in a loop on a sloping iron floor.

The finished rod is coiled and given a sulphuric acid bath to remove the oxide, after which it is put through



Intermediate Mill in the Hawthorne Works Rod Mill of the Western Electric Company, where Copper Rod Is Stretched from 139 to 1,200 Feet and Reduced in Thickness from One and One-half Inches to a Quarter of an Inch

a No. 1 wire drawing machine. These machines draw wire of the size used for telephone lines and do the preliminary drawing on wire that is to be drawn to smaller



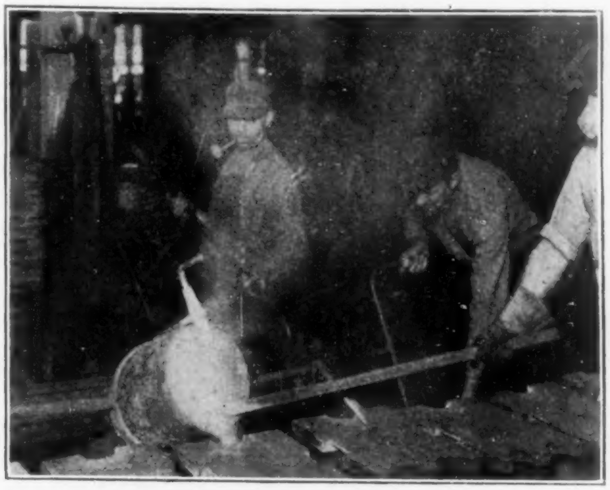
A No. 1 Drawing Machine at the Western Electric Plant. The Man at the Left Is Lining Up the Dies While the One at the Right Is Unloading a Drawing Coil

diameters in the second and third machines. Medium sizes, such as are used in lead covered cable, are drawn through the No. 2 machines, and the finest sizes, commonly called magnet wire, are finished in the No. 3 machines. Circular, chilled cast iron dies are used for all wire larger than .072 inches (13 gage), while diamond dies are used for all wire smaller than that. All dies are lubricated with a mixture of tallow, soap, and water.

The wire is annealed in water sealed furnaces at a temperature of 825 degrees to obtain the required hardness.

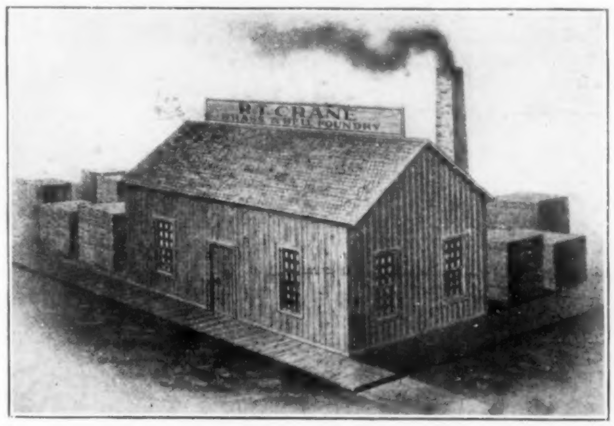
In the basement of the building are located the motors which drive the machinery, huge vats for the circulation of the lubricant and the recovery of scrap copper, and a large electrolytic tank room, where new equipment is now being installed to recover 350,000 pounds of copper from the sulphuric acid used to clean the coils.

The mill is equipped with 30 No. 1 drawing machines, part of whose output is 10,000,000 conductor feet of line wire per week. There are 112 units each of No. 2 and No. 3 drawing machines. The weekly output of the No. 2 machines includes 185,000,000 feet of toll cable wire and 375,000,000 feet of loop cable wire. The No. 3 machines turn out 750,000,000 feet of magnet wire each week. Six monorails cranes do their part in this tremen-



Pouring Metal Into Moulds at The Central Valve Manufacturing Company plant in Chicago

dous production by transporting the wire from place to place overhead.



Crane Company's First Building, Chicago

The plumbing and valve industry is represented by a number of companies. The Crane Company which has

Casting Shop, The Central Valve Manufacturing Company

its great Corwith plant, began with a tiny shop on July 4th, 1855. Richard T. Crane poured his first non-ferrous casting in a building having a floor space of about 700 square feet. The plant of the same company today covers 400 acres of floor space, and makes over 1200 different articles, from a 1/8" pipe plug to a 39" brass flanged gate valve weighing 6300 pounds. The brass foundry pours about 75 tons of metal per day, with 150 crucibles and 12 electric furnaces. Thirty different varieties of alloys are used, among them, the following:

Crane Hard Metal. A copper-tin-bronze of high strength and hardness.

Crane Special Brass. A high grade steam metal for valves.

Crane Stem Metal. A metal for valve stems having an average tensile strength of 55,000 pounds per square inch.

Crane Nickel Alloy. A copper-nickel-tin mixture with strong anti-corrosive properties.

The Central Valve Manufacturing Company has a plant covering over 70,000 square feet divided over three floors. Their product consists primarily of high grade brass valves, all of which contain certain patented features of construction for specific uses. Their manufacturing operations consist of making castings in brass, bronze, nickel and Monel metal, machining and finishing these castings and assembling valves and other steam specialties.

They operate oil-fired Fisher crucible furnaces, Tabor air squeezers, pattern draw molding machines, ball bearing roller conveyors for molds, Royer sand separators, sand blast tumbler mills, gas fired core ovens and the usual gate cutters, grinders and other equipment. They also have two oil-fired Hawley down-draft furnaces for heavier castings and a complete wood and metal pattern shop.

View of the Brass Foundry at the Plant of James B. Clow & Sons, Chicago, Ill.

James B. Clow & Sons specialize in plumbing brass goods. They have been in business for fifty years, manufacturing valves, faucets, wastes, etc., which are distributed throughout the entire United States.

Meetings and Papers

The program of the non-ferrous metal parts of the convention was published in our March issue. Elsewhere in this issue will be found such reports of the papers as have been obtainable at this early date. Briefly, the non-ferrous meetings consist of two round table luncheon meetings, one on shop practice and the other on cost methods; a morning session on foundry practice with papers on practical problems, reverberatory furnaces for melting aluminum, electric arc furnaces in the jobbing brass foundry; and a report of the chairman of the Non-Ferrous Division. Complete reports of these papers will be published as soon as possible.

The following is a list of the exhibitors:

List of Exhibitors

ABRASIVE COMPANY, Philadelphia, Pa.
ACME OIL CORPORATION, Chicago, Ill.
ADAMS COMPANY, Dubuque, Iowa.
ADVANCE MILLING COMPANY, Chicago, Ill.
AIR REDUCTION SALES COMPANY, New York, N. Y.
AJAX ELECTROTHERMIC CORPORATION, Trenton, N. J.
AJAX METAL COMPANY, Philadelphia, Pa.
ALBANY SAND AND SUPPLY COMPANY, Albany, N. Y.
ALLOYS & PRODUCTS, INC., New York, N. Y.
AMERICAN BRAKE SHOE AND FOUNDRY COMPANY, Chicago, Ill.
AMERICAN ENGINEERING COMPANY, Philadelphia, Pa.
AMERICAN FOUNDRY EQUIPMENT COMPANY, Mishawaka, Ind.
AMERICAN METAL MARKET, New York, N. Y.
AMERICAN VENT WAX COMPANY, Lockport, N. Y.
ARCADE MANUFACTURING COMPANY, Freeport, Ill.
AUSTIN COMPANY, Cleveland, Ohio.
AUTOMATIC TRANSPORTATION COMPANY, Buffalo, N. Y.
AXMANN SAND-THROWING MACHINE COMPANY, Cleveland, Ohio.

C. O. BARTLETT AND SNOW COMPANY, Cleveland, O.
H. L. BAUMGARDNER CORPORATION, Chicago, Ill.
BAUSCH AND LOMB OPTICAL COMPANY, Rochester, N. Y.
BEARDSLEY AND PIPER COMPANY, Chicago, Ill.
BETHLEHEM STEEL COMPANY, Bethlehem, Pa.
BLACK AND DECKER MANUFACTURING COMPANY, Towson, Md.
BLAW-KNOX COMPANY, Blawnox, Pa.
BRITISH ALUMINUM COMPANY, LTD., New York, N. Y.
BUCKEYE PORTABLE TOOL COMPANY, Dayton, Ohio.
CAMPBELL-HAUSFELD COMPANY, Harrison, Ohio.
CARBORUNDUM COMPANY, Niagara Falls, N. Y.
CARBORUNDUM COMPANY, Perth Amboy, N. J.
CHAIN BELT COMPANY, Milwaukee, Wis.
FRANK D. CHASE, INC., Chicago, Ill.
CHICAGO MFG. AND DISTRIBUTING COMPANY, Chicago, Ill.
CHISHOLM MOORE HOIST CORPORATION, Tonawanda, N. Y.
CLARK TRUCTRACTOR COMPANY, Battle Creek, Mich.
CLEVELAND VIBRATOR COMPANY, Cleveland, Ohio.
CLIPPER BELT LACER COMPANY, Grand Rapids, Mich.
CORN PRODUCTS REFINING COMPANY, New York.
DAYTON PNEUMATIC TOOL CORPORATION, Dayton, O.
DEISTER CONCENTRATOR COMPANY, Fort Wayne, Ind.
WM. DEMMLER AND BROTHERS, Kewanee, Ill.
DETROIT ELECTRIC FURNACE COMPANY, Detroit, Mich.
DIAMOND CLAMP AND FLASK COMPANY, Richmond, Ind.
HARRY W. DIETERT, Detroit, Mich.
JOSEPH DIXON CRUCIBLE COMPANY, Jersey City, N. J.
EASTERN CLAY PRODUCTS, INC., Buffalo, N. Y.
D. A. EBINGER SANITARY MFG CO., Columbus, Ohio.
ELECTRIC STORAGE BATTERY COMPANY, Philadelphia.
ELECTRO-CHEMICAL PATTERN AND MANUFACTURING COMPANY, Detroit, Mich.
ELECTRO REFRACTORIES CORPORATION, Buffalo, N. Y.
FANNER MANUFACTURING COMPANY, Cleveland, Ohio.
FEDERAL FOUNDRY SUPPLY COMPANY, Cleveland, Ohio.
FOUNDRY EQUIPMENT COMPANY, Cleveland, Ohio.
FOUNDRY SUPPLIES MANUFACTURING COMPANY, Chicago, Ill.
GENERAL ELECTRIC COMPANY, Schenectady, N. Y.
GIRARD SMELTING AND REFINING COMPANY, Philadelphia, Pa.
GLOBE STEEL ABRASIVE COMPANY, Mansfield, Ohio.
GREAT LAKES FOUNDRY SAND COMPANY, Detroit, Mich.
GREAT WESTERN MANUFACTURING COMPANY, Leavenworth, Kan.
HAYWARD COMPANY, New York, N. Y.
HERMAN PNEUMATIC MACHINE COMPANY, Pittsburgh, Pa.
HOOSIER MOLDING SAND COMPANY, Indianapolis, Ind.
HYNSON, WESTCOTT AND DUNNING, Chicago, Ill.
ILLINOIS CLAY PRODUCTS COMPANY, Joliet, Ill.
ILLINOIS TESTING LABORATORIES, INC., Chicago, Ill.
INDIANA CONSUMERS GAS AND BY-PRODUCTS CO., Terre Haute, Ind.
INDUSTRIAL MINERALS COMPANY, Columbus, Ohio.
INTERNATIONAL MOLDING MACHINE COMPANY, Chicago, Ill.
INTERNATIONAL NICKEL COMPANY, New York, N. Y.
IRON AGE PUBLISHING COMPANY, New York, N. Y.
W. A. JONES FOUNDRY AND MACHINE COMPANY, Chicago, Ill.
CHAS. C. KAWIN COMPANY, Chicago, Ill.
KEENER SAND AND CLAY COMPANY, Columbus, Ohio.
SPENCER KELLOGG AND SONS SALES CORPORATION, Buffalo, N. Y.
KLING BROS. ENGINEERING WORKS, Chicago, Ill.
KNEELER-BATES MFG. COMPANY, Indianapolis, Ind.
H. KRAMER AND COMPANY, Chicago, Ill.
LANCASTER COAL AND SAND COMPANY, Lancaster, Ohio.
LAVA CRUCIBLE COMPANY OF PITTSBURGH, Pittsburgh, Pa.
LINDE AIR PRODUCTS COMPANY, New York, N. Y.
LINDSAY-McMILLAN COMPANY, Milwaukee, Wis.
LINK-BELT COMPANY, Chicago, Ill.
LOUDEN MACHINERY COMPANY, Detroit, Mich.
LOWE MFG. COMPANY, Detroit, Mich.
MACLEOD COMPANY, Cincinnati, Ohio.
PAUL MAEHLER COMPANY, Chicago, Ill.
MALLEABLE IRON FITTINGS COMPANY, Branford, Conn.
MANHATTAN RUBBER MFG. COMPANY, Passaic, N. J.
MATHEWS CONVEYOR COMPANY, Ellwood City, Pa.
McCLOUD RIVER LUMBER COMPANY, San Francisco.
R. W. McILVAINE COMPANY, Chicago, Ill.
MILWAUKEE ELECTRIC CRANE AND HOIST CORP., Milwaukee, Wis.
MODERN POURING DEVICE COMPANY, Port Washington, Wis.
MOLINE IRON WORKS, Moline, Ill.
MOLTRUP STEEL PRODUCTS COMPANY, Beaver Falls, Pa.
MT. JEWETT FIRE CLAY COMPANY, Mt. Jewett, Pa.
NATIONAL ENGINEERING COMPANY, Chicago, Ill.
NATIONAL SMELTING COMPANY, Cleveland, Ohio.
NEW HAVEN SAND BLAST COMPANY, New Haven.
WM. H. NICHOLLS COMPANY, Richmond Hill, L. I., N. Y.
NORTHERN ENGINEERING WORKS, Detroit, Mich.
NORTON COMPANY, Worcester, Mass.
S. OBERMAYER COMPANY, Chicago, Ill.
OILESS CORE BINDER COMPANY, Cleveland, Ohio.
OLIVER MACHINERY COMPANY, Grand Rapids, Mich.
OSBORN MANUFACTURING COMPANY, Cleveland, Ohio.
PANGBORN CORP., Hagerstown, Md.
PEERLESS SAND COMPANY, Conneaut, Ohio.
PENNSYLVANIA LUBRICATING COMPANY, Pittsburgh.
PENTON PUBLISHING COMPANY, Cleveland, Ohio.
PICKANDS, BROWN AND COMPANY, Chicago, Ill.
PITTSBURGH ELECTRIC FURNACE CORP., Pittsburgh.
PORT CRESCENT SAND AND FUEL COMPANY, Detroit, Mich.
PYROMETER INSTRUMENT COMPANY, New York, N. Y.
ROGERS BROWN AND CROCKER BROS., INC., Cincinnati, Ohio.
ROHRBACHER SHOE COMPANY, Boston, Mass.
ROYER FOUNDRY AND MACHINE COMPANY, Wilkes-Barre, Pa.
SAFETY CLOTHING COMPANY, Cleveland, Ohio.
SAFETY EQUIPMENT SERVICE COMPANY, Cleveland, Ohio.
SAFETY FIRST SHOE COMPANY, Farmingham, Mass.
SAFETY GRINDING WHEEL AND MACHINE COMPANY, Springfield, Ohio.
SEMET-SOLVAY COMPANY, New York, N. Y.
SHEPARD ELECTRIC CRANE AND HOIST COMPANY, Montour Falls, N. Y.
W. W. SLY MFG. COMPANY, Cleveland, Ohio.
SMITH OIL AND REFINING COMPANY, Rockford, Ill.
WERNER G. SMITH COMPANY, Cleveland, Ohio.
SPENCER TURBINE COMPANY, Hartford, Conn.
STANDARD SAFETY EQUIPMENT COMPANY, Chicago.
STANDARD SILICA COMPANY, Chicago, Ill.
STERLING WHEELBARROW COMPANY, Milwaukee, Wis.
STONE PATTERN MOUNT COMPANY, Bloomfield, N. J.
SWAN-FINCH OIL CORP., Chicago, Ill.
SWARTWOUT COMPANY, Cleveland, Ohio.
TABOR MFG. COMPANY, Philadelphia, Pa.
TRUSCON STEEL COMPANY, Cleveland, Ohio.
W. S. TYLER COMPANY, Cleveland, Ohio.
UNITED COMPOUND COMPANY, Buffalo, N. Y.
UNITED STATES ELECTRICAL TOOL COMPANY, Cincinnati, Ohio.
UNITED STATES GRAPHITE COMPANY, Saginaw, Mich.
WADSWORTH CORE MACHINE AND EQUIPMENT COMPANY, Akron, Ohio.
F. H. WHEELER MFG. CO., Chicago, Ill.
WHITING CORPORATION, Harvey, Ill.
G. H. WILLIAMS COMPANY, Erie, Pa.
WILLSON PRODUCTS, INC., Reading, Pa.
YALE AND TOWNE MFG. CO., Stamford, Conn.
YOUNG BROTHERS COMPANY, Detroit, Mich.
ZANESVILLE SAND COMPANY, Zanesville, Ohio.

Melting Aluminum in Large Quantities

An Open-Flame Stationary Hearth-Type Furnace for Melting Aluminum and Its Alloys

By ROBERT J. ANDERSON,[1] GEORGE E. HUGHES,[2] and MARSHALL B. ANDERSON,[3]

A PAPER READ AT THE FOUNDRYMEN'S CONVENTION IN CHICAGO, APRIL 8-11, 1929.

Introduction

THIS paper describes an open-flame stationary hearth-type furnace suitable for use in melting aluminum and aluminum alloys. The present writers have designed, built, and operated a number of furnaces of this general type in the past ten years, and have found them to be eminently satisfactory. Moreover, the furnace to be described here has application for a number of different melting operations in the aluminum industry. It is well suited for melting in both sand and permanent-mold casting work. The furnace, with variations in design, may be built in capacities of up to 50,000 pounds of aluminum or even larger. Furnaces of this type ranging from 2,000 to 50,000 pounds capacity have been built by the writers.

The question has often been asked: What is the best type of furnace to use for melting aluminum alloys in foundry practice? Various answers have been given to this query, the consensus of opinion being that no particular type of furnace is best suited to all possible conditions. However, as indicated just above, the present type of furnace is well adapted for a number of different applications, and where the quantity of metal to be dealt with is sufficiently large, this furnace may be regarded as practically universal. The fuel efficiency of the open-flame furnace and its high melting speed are advantages which are well known.

It should be said in passing that the tendency in aluminum-alloy casting practice of late years has been toward melting in large units. This has become a necessity because of the large production turned out daily by the leading foundries. Too, the size of castings poured has been continually increasing. The technique of handling large quantities of liquid aluminum alloys has now been well developed. In the case of alloys to be poured into castings for heat treatment, it is desirable to make the alloy up first, then pour into pigs, analyze, and then make any desired corrections in the composition on a second melting. Naturally, it is preferable to prepare such alloys in large lots.

In general jobbing work, there has been a marked tendency in the past ten years to use large quantities of casting scrap in the furnace charges. This scrap is of such a character that it must be melted down in a furnace of considerable size, having large doors, or else be broken up for charging into small furnaces. Speaking generally, and taking into account present conditions, it appears to the writers that the hearth-type furnace is one of the best all-around furnaces to use where the amount of metal to be handled daily is sufficiently large.

Melting Furnaces in General

In a discussion of furnaces for melting aluminum and its alloys, it has been pointed out by one[4] of the writers that a great variety of furnaces are used and that there is no standard practice. Thus, in foundry work, the following types of furnaces are, or have been, employed: Gas- or oil-fired stationary or tilting iron-pot furnaces; gas- or oil-fired stationary or tilting crucible furnaces; coke-fired pit crucible furnaces; gas- or oil-fired open-flame tilting pear-shaped (so-called "tea kettle") or cylindrically-shaped furnaces; gas- or oil-fired open-flame stationary hearth-type (so-called reverberatory) furnaces; gas- or oil-fired open-flame tilting reverberatory furnaces (usually of small capacity), and electric furnaces, principally of the resistor type.

In secondary aluminum work, iron-pot furnaces, crucible furnaces, and open-flame stationary hearth-type furnaces have been used largely; the firing is usually by oil and less often by gas. In rolling-mill practice, the open-flame stationary hearth-type furnace is favored, although other types have been employed. The hearth-type furnace in rolling-mill work is fired by gas, oil, coal, or coke. Some operators prefer coke firing. Some other types of furnaces not mentioned above have been used in a small way in the aluminum industry.

Speaking generally, in foundry practice, aluminum alloys have been melted in relatively small quantities. Thus, typical furnaces which have been favored for foundry melting include the stationary iron pot of 300 pounds capacity and the tilting iron pot of 500 pounds capacity. On the other hand, in some plants, open-flame cylindrical furnaces of 1,000 pounds capacity, and stationary hearth-type furnaces of about 6,000 pounds capacity have been used to a less extent. Small units are uneconomical to operate, both as to labor and fuel, when the total quantity of metal to be handled per day is large. Moreover, a battery of small units having capacity equivalent to that of a single large unit takes up an undue amount of floor space.

Where daily output is small, say upwards of one to three tons, the small iron-pot furnace is satisfactory, although even when handling such relatively small quantities, the present writers prefer an open-flame furnace

Fig. 1—Photograph of 12,000-Pound Capacity Open-Flame Stationary Hearth-Type Furnace, as Built

[1] Vice-president (in charge of production). [2] Superintendent (metal department), and [3] Plant Engineer, Fairmont Manufacturing Company, Fairmont, W. Va.

[4] Anderson, R. J., ALUMINUM AND ALUMINUM-ALLOY MELTING FURNACES, Trans. American Foundrymen's Association, Vol. 30, pp. 562-604, 1923.

The open-flame stationary hearth-type furnace may be built in any reasonable size to suit requirements. While the iron-pot furnace has been generally favored in foundry practice, and in fact has been fairly standard (if any furnace in aluminum-alloy foundry work has been standard), the writers feel that the hearth-type furnace is far superior, particularly as regards fuel economy.

Description of the Hearth-Type Furnace

Fig. 1 shows a photograph of a 12,000 pound capacity gas-fired open-flame stationary hearth-type furnace as built, and Fig. 2 is a detail drawing showing the construction of the furnace. The figures are self-explanatory. The hearth, side walls, and roof are built of good grade fire brick, while the outside face walls may be made of common brick. Preferably, a 4-inch layer of insulating material such as cork brick or sil-o-cel brick should be run between the 9-inch wall, hearth, and roof bricks and the outside facing bricks. Light old rails may be used for the buck-stays. Furnaces of this type must be well ironed in order to counteract the expansion of the walls when heated. Casing with steel or cast-iron plates is not necessary with the smaller furnaces, but is advisable in the larger sizes, at least to cover the walls from the upper limit of the metal level to a few inches below the floor line. In the smaller sizes, e. g., 2,000 pounds' capacity, the entire furnace, except the roof, may be cased, and buckstays not used. A good solid foundation should be provided for this type of furnace.

In the preferred design, cross firing is employed, i. e., the burners are situated in the back wall (at the stack end), and the products of combustion must pass outward from the burners towards the front wall and then back to escape through a flue to the stack. This method of firing has shown definite economies over firing through the side walls or the front wall. For further fuel economy, it is advisable to keep the furnace fairly well heated even if not in use for melting for reasonably short periods of time, e. g., a few days. This practice will, incidentally, increase the life of the refractories. The furnace may be fired by gas or oil as desired. In the design shown, the flue was built as indicated in order to locate the stack outside of a building. In usual construction, the stack would be built against the back wall, and the burners would be situated on either side of the stack.

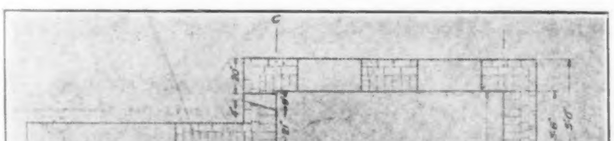


Fig. 2—Detail Drawing Showing Construction of the Furnace in Fig. 1

As will be seen, the furnace has four large charging

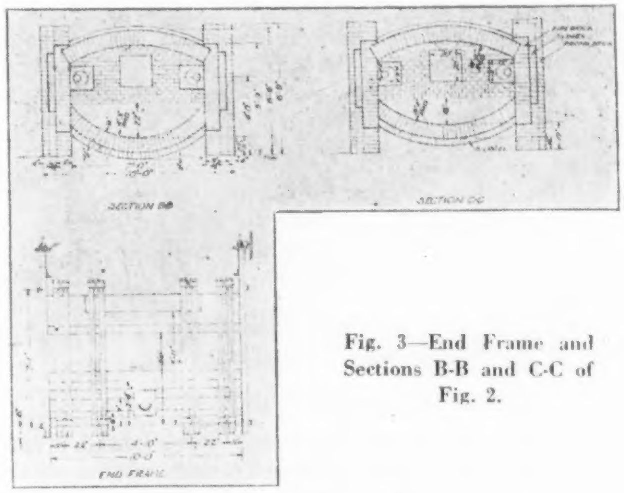


Fig. 3—End Frame and Sections B-B and C-C of Fig. 2.

doors, two on either side. These doors permit easy and rapid charging. Liquid metal is removed from the furnace by tapping through a tap hole and runner in the front wall. Small or large quantities of metal may be readily removed from the furnace into carrying crucibles or bull ladles. In tapping, metal is permitted to flow down the runner by simply pulling out the tap plug and inserting a "needle" bar into the tap hole to break through any incrustation. When sufficient metal has been taken out, the flow is stopped by inserting another plug. Melting is rapid, and dross losses are reasonably low with proper burner operation. In the furnace shown, the melting time is about three hours for 10,000 pounds of metal, if cold metal is charged to the furnace heated to 1,400 degrees Fahr.

The furnace may be fired with the usual conventional burners, details of which need not be given here. The life of the open-flame hearth furnace, if property constructed and "broken-in" and given adequate attention, is at least two years. If run steadily, the walls should be chipped down about once a week.

Application in Melting Different Materials

As already stated, the furnace under discussion has application for a number of different melting operations in aluminum work. Thus, in sand-foundry practice, alloy ingot of suitable composition as furnished by secondary smelters or other producers, for making castings, may be simply charged together with gates, risers, and other foundry returns, and melted. The melt may readily be maintained at the proper temperature, and metal removed as required for pouring. In the same way, casting alloys may be made up in the furnace from a suitable charge of primary metal, scrap, and hardeners. In permanent-mold-casting practice, after charging and melting, the liquid alloy may be drawn off and distributed to holding pots as required. In alloy casting work, the 10,000- to 25,000-pound capacity furnace has the advantage of providing large quantities of metal of the same analysis, as contrasted with a battery of small units where the metal from

each unit is liable to vary in composition. Of course, in melting large quantities of alloys, the bath should be stirred frequently and at least before any tapping so as to avoid segregation.

In secondary aluminum practice, the furnace is well adapted to melting all kinds of scrap. Thus, large and heavy scrap, like old crankcases, can be readily charged, the doors being sufficiently wide to take such scrap without breaking it. Too, the puddling of borings or dross metallics may be readily done in this type of furnace. The larger sizes are especially suitable for use in secondary aluminum work, since it is advisable to remelt scrap in large individual lots. Hardeners, for use in making fixed additions of alloying metals to aluminum, can be readily made in the open-flame stationary hearth furnace, unless of too high melting point. Thus, 50:50 copper-aluminum and 90:10 aluminum manganese may be made to advantage in this type of furnace. For hardeners of rather high melting points, the writers prefer the open-flame cylindrical tilting furnace, but not of large capacity.

Finally, this furnace is quite suitable for melting aluminum and its light alloys for the production of rolling ingots and other ingots, billets, and shapes for subsequent working.

In the writers' practice, the furnace in question has been used for all the purposes above mentioned.

Fuel Efficiency and Cost of Melting

As is well known, aluminum and aluminum-alloy melting furnaces have been notoriously inefficient as to fuel consumption per unit weight of metal melted. Thus, the ordinary stationary or tilting iron-pot furnace has a fuel efficiency of only 6 to 10 per cent, using either gas or oil as the fuel, while the average efficiency of the open-flame pear-shaped furnace is about 15 per cent. Tests on several different units of the present type of furnace show fuel efficiencies of 20 to 25 per cent.

Thus, taking a given furnace of the general design shown but having a capacity of 26,000 pounds and having two opposed burners in each side wall, and using figures obtained during a run of about one month on heavy melting stock, it was shown that the gas consumption was about 2 cubic feet per pound of metal melted. The fuel was natural gas, having a calorific value of about 1,000 B.t.u. per cubic foot. As may be shown by simple calculation, it requires about 495 B.t.u. to raise one pound of aluminum from room temperature to 1,400 degrees Fahr. With 1,000 B.t.u. gas, there is actually being used about 2,000 B.t.u. to accomplish the melting. Hence, the indicated furnace efficiency is

$$\frac{495}{2,000} \times 100 = 24.75 \text{ per cent}$$

In this case, the gas consumed included that required for pre-heating the furnace, maintaining it hot between charges, melting, and holding the metal at the required temperature. Figuring gas at 37 cents per 1,000 cubic feet, or 1,000,000 B.t.u. for 37 cents, then the cost of the fuel for melting is 0.074 cent per pound or $1.48 per short ton.

Preliminary figures obtained during the course of tests on furnaces fired from burners in the end wall at either side of the stack indicate higher fuel efficiency by this method of firing. Of course, it is understood that the indicated efficiency of any metal melting furnace is affected by many factors, and a given furnace may show widely different fuel consumption under different conditions.

Tinning Seamless Tubes

Q.—What is the most practical method at present for tinning brass and copper tubes which are to be cold drawn after tinning; or which are to be tinned without further drawing? Tubes range from 3/8" O. D. to 6 5/8" O. D. inclusive.

A.—Method used in tinning seamless brass and copper tubes:

EQUIPMENT

A cast iron trough, U-shaped, about ten inches across the top, seven inches deep, and twelve feet long. The length is governed by the class of work being tinned. The trough is mounted on a brick furnace, supported by the flanges on the trough. The fuel used is, generally, oil. Three burners are used on a twelve-foot furnace, arranged at distances that will give the most uniform heating throughout the length of the trough.

A wooden trough made V-shape. This is as long as the melting trough; its purpose is to contain the "hope" (zinc chloride).

CREW

Four men are used for fast work. The tinner, helper, and two wipers. Sometimes one wiper is used, and is helped by the tinner's helper.

OPERATION

The tin is melted, and held at about 750° F. The tubes are then prepared by immersing several in the "dope" trough, after which they are removed and drained, and allowed to dry off surplus dope. This is done by the use of a draining table, a board about eight inches wide running parallel with the "dope" trough, with a raised rack at one end. This allows the tubes to rest at a sharp incline. The draining table is so arranged the surplus dope drains back into the dope trough. The tinner and his helper pick up a tube from the draining rack, with the aid of iron hooks, the hook end having a right angled bend. By inserting the hook in either end of the tube, the tube is plunged in the tin bath, the helper lowering his end first, and the tinner completes the immersion by slowly lowering the tube until covered by the tin. (If the tube is too wet with the dope there will be spitting of the tin and some danger). The tube is then rapidly lifted from the tin bath, the tinner raising his end high enough to allow the tin to run out of tube back into the bath. The tube is transferred to the wiping rack, which consists of a single wooden horse, about two and a half feet high. The tinner's end rests on the horse, the helper's end is set on the floor. The tinner holds his end with a pair of round-jawed tongs that grip the inner and outer walls. The first wiper with a piece of tow in each hand grasps the tube firmly, rapidly drags the tow over the length of the tube, and is followed by the second wiper, similarly equipped. This finishes the outside wiping, and should result in a smooth finish. Then follows the inside wiping. The larger diameters are wiped by thrusting a rod with one end, wrapped with tow, through the tube. Condenser tubes are inside wiped by placing a cork that fits the tube snugly, and pushing it through with a rod. Wooden rods are used to prevent scratching the tube. A trained crew completes this succession of operations very rapidly. Any delay that allows the tin to harden makes a lumpy job. When pure tin is specified, as in Government work, the wiping is more difficult, than when 8 per cent to 10 per cent of lead is allowed in the mixture, as in some commercial work.

—William J. Pettis.

The Fundamentals of Brass Foundry Practice

A Description of the Basic Laws Which Control the Melting and Casting of Metals and Their Application to Practical Foundry Work—Part 21*

By R. R. CLARKE
Foundry Superintendent

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

DROP pouring is still another means of purging metal by surface floating its dross. It consists of a runner box of volume with a button hole at the one end, this hole being fitted up with a "stopper" or plug core (Fig. 70). In placing this runner box, which is best made in dry core (especially its bottom surface) the plugged hole

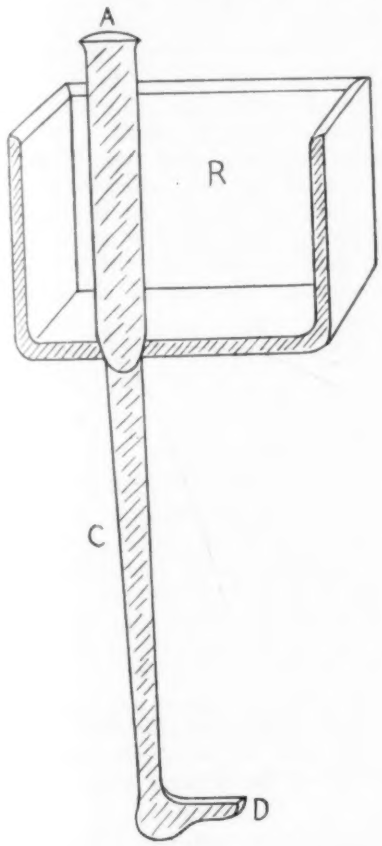


Fig. 70—Drop Pouring Arrangement. R, Runner Box. A, Stopper Core. C, Drop Gate. D, Delivery Gate. Box R is filled level with metal. Stopper Core A Is Lifted and Pouring Is Gauged to Keep Runner Box Filled While Casting Is Running

is set fairly over the pouring sprue on the cope surface. In pouring, the box is filled with metal, the stopper core lifted and the pouring so gauged as to keep the box filled throughout to the pouring finish. Deep runner boxes poured from the end opposite the bottom hole and kept well fitted throughout, render remarkably clean castings. As a matter of caution it might be noted that suddenly jerking the stopper core entirely out creates a temporary vacancy at the depth of the metal pool and directly over the sprue down which surface dross and pocketing air is drawn. Besides it subjects the gates to a maximum of force and violence from the falling metal. The plug core should therefore be lifted slowly until after the gates are filled then gently withdrawn altogether. When the object is quick and rapid transit of metal as in running thin castings, the core should be lifted suddenly but only high enough to allow free escape of metal. To jerk the core suddenly and entirely out of the pool tends to defeat rather than favor the objective.

In passing it might be well to recall that drop-pouring is a severe tax on the strength and stability of the mold. The mold should therefore be constructed with this in mind. On the efficiency of the method no doubt can exist; its principles are sound, its results corroborative. The author has found it a great aid in producing large copper castings weighing up to 1700 pounds. The castings were of depth and poured from the bottom. Crushed charcoal in quantity was placed in the bottom of the runner boxes, the metal poured in and the core lifted. The charcoal, covering the metal surface and protecting against the atmospheric influence up to the latest point of exposure, had a decidedly beneficial effect on the gases and oxides so stubbornly persistent in pure copper manipulation. The metal entered the molds clean, limpid and clear, filled them quickly and shrunk in the feeders nicely.

The Deflecting or Un-loading Type of Skim Gate

This method of purging metal consists in carrying the dross with the metal current freely, and rapidly in straight line to some point of deposit and unloading it there. From some point of vantage along this line of rapid transit a branch gate is taken off to the casting. This branch works best when striking off at either a right or an obtuse angle to the direction of main current. Fig. 71 will illustrate and shows that by keeping the pouring gate "A" full while pouring, metal and dross drive rapidly across the straight live runner to deposit riser "B", while clean metal works back through delivery "C" to the casting. The method is especially active at the beginning of pouring, taking care of the dross entering the runner while the pouring sprue is filling to full level, as well as the gate sand sweepings in the first metal poured. Its correct constructive principles are that the straight line runner be properly sized to keep pouring sprue filled at rapid pouring rate; that deposit B be ample to receive the discharge without checking it; that branch gate lead off so as not to deflect the main line current; that it be sized

Fig. 71—Type of Unloading Gate.

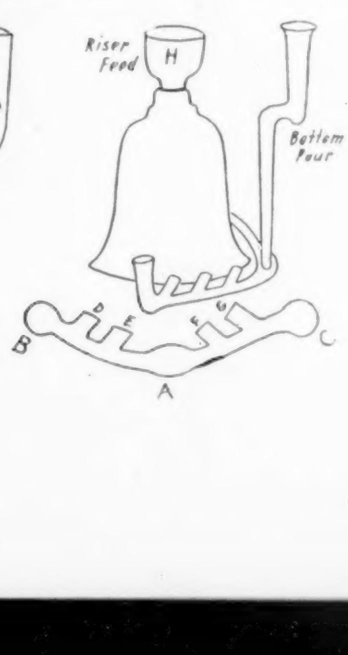


Fig. 72 (at right) —Bell Casting, Bottom Poured

 This series will be collected and published in book form. Parts 1 to 20, inclusive, were published in our issues of July, August, September, October and November, 1926; January, February, March, April, May, August, September, November and December, 1927; March, April, May, August, September and December, 1928; and March, 1929.

to offer at least some resistance to flow; that the pouring sprue be sized to deliver when kept full, all the metal the main runner will transmit; and that the pouring sprue be kept always to its ful height level during pouring. Keeping this pouring sprue well filled is a very important factor in nearly all efficient skim gating. On it depends the exclusion of much dross, the volume, and velocity of current and other critical details. That this type of skim is constitutionally certain to exclude all dross after the gates have once been well filled is an exaggeration. That it takes care of much of it is, none the less, a practical certainty.

Combining the Two Types in the Same Unit

This approximates the maximum of skimming efficiency. The bell casting illustrated in Fig. 72 will illustrate. It shows bottom pouring through runners terminating in repository "bobs" or risers and from which runners thin deliveries lead to the casting. The pouring aims only to run the casting clean, shrinkage being

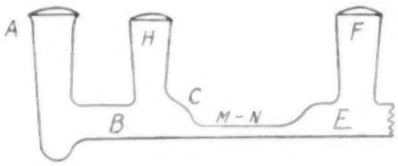


Fig. 73 — Another Form of Combination Skim

delegated to the feeding riser "H", on the hub of the bell. These castings made in this way came perfectly free of dross either on the surface or under the skin.

Fig. 73 shows another form of the combined type. Metal is poured down "A" through runner of volume "B" to point "C" where the thin choking section "m-n" stretches shortly then enlarges to delivery section "E." At point "C" riser "H" is placed to function as a repository; "F" is simply a feeding sprue. In pouring the metal rushes to point "C", is checked and deflects upward into a reservoir where its dross is trapped.

The Centrifugal Principle of Skimming Metal

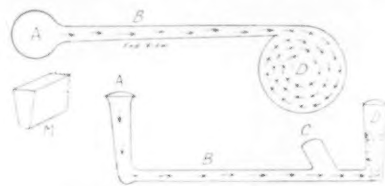
If metal can be whirled rapidly in a disc or column it will tend to fly off from its centre of rotation to a straight line direcion. If the disc or column revolve in vertical position the effect expresses itself horizontally. If, horizontally, the effect becomes vertical. Now the agent responsible for this is known as "centrifugal force," which tends to break down cohesion in the revolving body, and throw its particles off at a tangent to straight line direction. Because of this force, water and mud fly off automobile wheels, emery wheels and fly wheels burst, trains thrust in rounding curves etc. In a liquid, centrifugal force tends to throw the liquid out and against the walls of its revolving container and distribute it there in uniform section. And that in substance is the principle of centrifugal casting hollow castings.

Practically every solid incorporated in the body mass of liquid metal is lighter than the metal itself. These lighter substances such as dross, scale, sand, etc. are therefore less able to resist the centrifugal force acting on them than is the heavier metal itself and are thrown with the liquid metal toward its bounding confinements which are its container walls bearing on the outside surface of the casting. The body mass will therefore be left happily free of these impurities. Such is the principle of spinning a mold to favor clean body metal in the casting.

Metal whirling in a vertical sprue generates centrifugal force and presses the metal against the walls of the sprue. This pressure finds the line of least resistance vertically upward and the metal in whirlpool fashion mounts high in the sprue, all the while tending to hollow or core out its centre, resulting in a concave or "V" shaped depression in the sprue metal surface. Again, the lighter impurities, less able to dispute the force are cast quickly to this surface, worked inward, pocketed in the depression and held there absolutely against their return downward.

This furnishes the basis for the spinner type of skim gate shown in Fig. 74, one of the most efficient of all devices for mechanically, purging metal. In the figure mentioned, "A" is the pouring gate, "B" the transverse runner, "C" the choking delivery and "D" the spinner, sprue and depositing Reservoir. Section M shows the

Fig. 74 — Spinner Type of Skim Gate



transverse runner form. This runner leading from A to D joins D at a tangent instead of in the centre as shown in end view "EE." In pouring, metal rushes rapidly across "B" strikes the circular wall of D, takes on a spinning or whirling motion of such force and speed as to fairly churn the dross out of the metal and throw it high and dry to surface metal of D. This gate has been found practically perfect in making spotless axle linings, cast in the cope of the mold, and is equally efficient in bottom gated molds. In top gate molds its efficiency depends much on the resistance of the delivery gate, which in turn reverts to its size.

This series will be continued in an early issue.—Ed.

Finishing Watch Cases

Q.—We are sending you a watch that has been chromium plated. What we would like to get is something that will cover the face of the case and not let anything get into the embossings.

You will notice the finish on the case. At present we are putting the old Butler finish on these cases. What is the exact way to get an emery finish on the back of the watch case?

Is there any way to oxidize chromium plated articles?

A.—The finish that you refer to on the backs of some watch cases is an emery finish and the character of this finish depends upon the grade of emery used. A fine emery produces fine lines, and a coarse grade, heavy lines.

The finish should be produced before plating. After plating, spray with a lacquer enamel and relieve on a cotton buff wheel. There is no chemical method of oxidizing chromium that we are aware of.

—Oliver J. Sizelove.

Lining for Nickel Alloy Furnace

Q.—We are seeking a method of preparing a suitable lining for a furnace used to melt an alloy containing 85% zinc and 15% nickel. This lining is to be used in an open flame, oil fired furnace.

A.—You should have no trouble in preparing such a lining. Take a standard furnace lining and put it into the furnace. Then make a good mixture of 6 parts carborundum fire sand and 1 part Germany clay. When this is well mixed and in the form of a clay, apply it to the surface of the brick furnace lining.

—William J. Reardon

British Institute of Metals Meeting

Abstracts of the Papers Read at the Meeting Held in London, England, March 13-14, 1929

RECENT DEVELOPMENTS IN ELECTRIC FURNACES

By D. F. Campbell

The paper describes the improvements and modifications in melting practice during the last two years, and discusses the relative performance of small and large induction furnaces, and the reasons for selecting the size of unit according to the work to be done. A short description of improvements in practice with high-frequency furnaces and details of new methods of lining these furnaces are given. A general survey of heat-treatment furnaces follows, with a detailed description of the construction and performance of a number of specific furnaces, including a continuous furnace for annealing brass strip. The largest brass works, where electricity is utilized more than elsewhere, is described, with explanation of the uses to which electricity has been applied; with diagrams showing the energy consumed and the effect of the special precautions used to improve power and load factor.

AN IMPROVED FORM OF ELECTRIC RESISTANCE FURNACE

By W. Rosenhain and W. E. Prytherch

An electric resistance furnace is described for which advantages are claimed in regard to higher available working temperatures (up to 1400° C.), durability, and freedom from oxidation of the carbon resistor. The heating element of this type of furnace consists of carbon or graphite pellets, or short rods placed end to end in a refractory sheathing tube which fits easily over them. Heating occurs by contact resistance. The sheathing tube prevents the access of air sufficiently to avoid any appreciable burning of the carbon.

NOTE ON THE TESTING OF ELECTRO-DEPOSITS ON ALUMINUM

By G. B. Brook and George H. Stott

The work outlined in the following paper represents investigations carried out during the past year on a considerable number of samples of commercial electroplating on aluminum. Most of these were finished in nickel as being the commonest metal used for securing a finish in general commercial practice. This contribution is not concerned with the actual plating of the material, but is confined to the development of a test, or tests, which indicate the stability of the deposit; it is rather from the user's than from the producer's standpoint that the tests have been evolved.

THE IMPORTANCE OF DESIGN AND SETTING OF LARGE KETTLES USED FOR REFINING AND LOW MELTING-POINT ALLOYS

By Harry C. Lancaster

The author deals with some of the problems met with in increasing the size of kettles from 20 tons to 50 tons capacity, and shows how the larger units require radical alteration in design to be successful in practice. It is also demonstrated that close attention to details has given increased life to the kettles themselves, with consequent reduction in the cost of the metal treated.

BRITTLENESS IN ARSENICAL COPPER

By Clement Blazey

In a paper previously presented to the Institute, a description was given of a type of brittleness in arsenical copper characterized by low tensile strength and elongation, a non-necked, intercrystalline fracture, and inability to withstand repeated bending after annealing below 600°-650° C. After annealing at a higher temperature the brittleness disappeared, but it reappeared when the copper was cold-worked and again annealed at a relatively low temperature. At the time, the cause of the trouble could not be ascertained.

A series of melting and working tests has since been carried out. It has been found that, under certain conditions, a small amount of bismuth (about 0.004 per cent.) can produce a susceptibility to brittleness remarkably like that previously described.

The conditions are: plain melting under charcoal of arsenical copper of the quality used, followed by poling and the addition of bismuth before casting. The addition of phosphorus after bismuth destroys the susceptibility. The susceptibility may be removed by remelting. If phosphorus is added, then one remelting is sufficient; but if phosphorus is not added, several remeltings may be necessary. If the metal is in the form of fairly fine wire, then long heating in hydrogen at a high temperature removes the susceptibility. The brittleness has been encountered in non-arsenical copper.

SPECIAL PROPERTIES OF EUTECTICS AND EUTECTOID ALLOYS IN BINARY METALLIC SYSTEMS

By Professor P. Saldau

(1) The hardness and electrical resistance of a number of eutectic alloys have been studied, and it is shown that the eutectic occupies a special and abnormal position on the property-composition curve, even in drastically annealed alloys.

(2) It is pointed out that for coalescence to occur in eutectic alloys, an excess of one of the phases is necessary.

(3) Polymorphic changes in some of the constituent metals of the system have been studied.

WORK-SOFTENING AND A THEORY OF INTERCRYSTALLINE COHESION

By F. Hargreaves and R. J. Hills

Further investigation on work-softening has led to the establishment of the conditions necessary for its occurrence. They are (a) the presence of more than one phase; (b) roughly, both constituents must have the property of undergoing spontaneous annealing after working at air temperature.

A theory of intercrystalline cohesion is outlined. Briefly, it postulates the existence of a transition zone between two orientations. This is not to be regarded as amorphous metal, for, given the same two orientations and the same relative position of the boundary, the same pattern of atomic arrangement is always found in the unstressed metal.

The conditions respecting the effect of stress and recovery are considered. Boundaries between different phases are discussed, and some of the differences to be expected are pointed out.

The cause of "creep" is attributed essentially to boundary action, and facts are given which indicate that the origin of fatigue is to be sought at the boundaries.

Work-hardening and work-softening are shown, it is claimed, to be identical phenomena concerning the early stages of the latter. The cause of the very pronounced softening by heavy working is attributed to interphase boundary action and the retention of the individual phases in a quasi-viscous condition.

Other phenomena are considered in relation to the theory.

THE AGE-HARDENING OF SOME ALUMINUM ALLOYS

By Marie L. V. Gayler and G. D. Preston

The following physical properties of five typical aluminum alloys containing copper, magnesium silicide, or both, have been examined under similar conditions of heat-treatment: (1) Brinell hardness; (2) tensile strength; (3) density; (4) electrical conductivity; (5) changes in the crystals, as determined by X-ray analysis.

It is shown that the changes in density and in lattice parameter which take place during ageing suggest that precipitation from solid solution takes place. X-ray analysis shows also that the crystals themselves are in a disturbed state, which is gradually relieved by further ageing at high temperatures. The increase in electrical resistance on ageing corresponds to this distortion of the space lattice of the solid solution, caused by the presence of minute particles due to the decomposition of the solid solution.

It has been inferred that the precipitation from solid solution entails two processes—(1) the rejection of the atoms of the dissolved metal from the lattice of the solid solution, accompanied by the possible formation of molecules; (2) a "coagulation" of these rejected atoms or molecules takes place, a process which follows closely upon the first, and probably largely overlaps it.

The evidence given may be regarded as strong confirmation of the theory that hardening is due to the precipitation of highly dispersed particles.

THE CONSTITUTION OF THE CADMIUM-RICH ALLOYS OF THE SYSTEM CADMIUM-GOLD

By P. J. Durrant

The constitution of the alloys of cadmium and gold from 0 to 48 atoms per cent of gold has been reinvestigated by the methods of thermal and micrographic analysis.

Saldau's equilibrium diagram, published in 1915, has been modified in the following manner:

(1) The liquidus from the eutectic point at 7.95 atoms per cent of gold and 309° C. rises not to a triple point at 25 atoms per cent of gold and 495° C., but to a maximum at 28.6 atoms per cent of gold and 500° C., and thereafter falls to a eutectic point at 30.0 atoms per cent of gold at 496° C. The horizontal line drawn by Saldau at 495° C. is not, therefore, a peritectic but a eutectic horizontal. Between the compositions 30.0 and 48 atoms per cent of gold the form of the liquidus is not a smooth curve, but is broken by a sharp discontinuity at 39.4 atoms per cent of gold and 540° C., where a peritectic line meets the liquidus.

(2) A new area of solid solution has been detected (denoted as phase III in the paper) which lies in the field described by Saldau as containing $\beta + \gamma$. This solid solution has been closely studied and has been found to undergo two polymorphic changes—one at about 500° C., and the other at about 375° C. The change at 375° C. is interesting, as it is analogous to the change in the β phase of brass at 460° C.

(3) No evidence could be obtained for the existence of the compound $AuCd_3$ at the liquidus, but the form of the equilibrium diagram suggests the existence of two compounds, Au_2Cd_5 and Au_2Cd_3, both of which are much dissociated at high temperatures.

ALLOYS OF ZIRCONIUM

By C. Sykes

Measurements of certain electrical and magnetic properties of copper-zirconium, iron-zirconium, and nickel-zirconium alloys are given. These show that the addition of zirconium leads to no material improvements in the properties of the metals, and in certain cases is detrimental.

Two further partial series of binary alloys are described—viz., aluminum-zirconium and silver-zirconium. The systems exhibit little solubility in the solid state at room temperatures and intermetallic compounds are formed. In the low-percentage alloys—viz. 10 per cent—the compounds crystallize in the form of long, fine needles, and consequently the structure of the alloys is very coarse. Hardness figures for aluminum and silver-zirconium alloys are given, together with measurements of tensile strength, ductility, corrodibility, and resistivity of the aluminum alloys.

THE RESISTANCE OF ZINC TO INDENTATION (A PRELIMINARY ACCOUNT)

By J. Newton Friend and W. E. Thorneycroft

A machine is described for determining the rate of indentation of zinc by a steel conical die acting under small gravity loads. For the range of loads employed the relation, at constant temperatures, between depth of indentation, D, applied load, L, and duration, θ, of application of load is given approximately by

$$D = aL^{p}\theta^{m},$$

where a is the depth of indentation produced by a load of 1 kg. acting for 1 sec., and p is a constant. The nature of m requires further investigation. The a-temperature curve shows a change in direction at 160°–170° C., which is significant, in view of the supposed allotropy of zinc in this region.

THE SOLUTION OF PLAIN AND AMALGAMATED ZINCS IN ELECTRIC BATTERIES

By J. Newton Friend

It is shown that for use in electric batteries with dilute sulphuric acid or with saturated ammonium chloride solutions plain high-grade 99.9 per cent zinc cannot satisfactorily replace the amalgamated metal; neither is there any material advantage in using amalgamated pure zinc instead of amalgamated ordinary commercial 98 to 99 per cent zinc.

THE SILVER CONTENTS OF SPECIMENS OF ANCIENT MEDIÆVAL LEAD

By J. Newton Friend and W. E. Thorneycroft

The silver contents of 20 specimens of ancient, Roman, and mediæval lead have been determined. Spartan lead votive figurines, *circa* 700 to 500 B.C., were found to contain 0.0569 per cent silver, or 18½ oz. silver per ton. The pre-Roman lead does not appear to have undergone any treatment for desilverization.

A NOTE ON THE HAUGHTON-HANSON THERMOSTAT. A METHOD OF FINE ADJUSTMENT

By P. J. Durrant

A modification of the "cold-bulb" of the Haughton-Hanson thermostat is described, by means of which the temperature of the thermostat can be adjusted over a range of about 5° C. with an accuracy of 0.1° C.

Testing Materials Committees Meet

Group Meeting of American Society for Testing Materials Committees at the Stevens Hotel, Chicago, March 19-22, 1929

General Account of the Meetings

THE annual spring group meeting of committees of the American Society for Testing Materials was held at The Stevens in Chicago, March 19, 20, 21 and 22. This plan of holding a number of committee meetings over consecutive days, which is probably unique in the activities of this Society, has worked out very successfully, conserving the time and expense of those members serving on a number of committees. The saving in expense in connection with this meeting was greater since, because of the number involved, the railroads granted reduced rates on the Certificate Plan. The committees met early and late, starting with sessions in the morning and extending through the afternoon and evening with but one break, a dinner and entertainment on Wednesday evening.

In all 25 committees of the Society took part as indicated below, but with the many sub-committee meetings that were necessary the number of meetings held during these four days totalled approximately 93.

Committee B-1 on Copper Wire

Committee B-1 on Copper Wire at its meeting on Wednesday, March 20, at Chicago, took action to recommend that the Tentative Specifications for Bronze Trolley Wire be advanced to standard. These specifications are the joint work of the A. S. T. M. and the American Railway Association, the latter body having already adopted these specifications as its standard.

The committee is making progress in the development of specifications for wire and cable for use in transmission lines for electric power. This work is progressing jointly with the National Electric Light Association.

The committee is actively working in cooperation with the National Electrical Manufacturers Association and the American Mining Congress in the development of standards for trolley wire for use in mines.

Sub-Committee VII, of Committee B-2 on Non-Ferrous Metals and Alloys, on Methods of Chemical Analysis

A meeting of Sub-Committee VII, of Committee B-2 on Non-Ferrous Metals and Alloys, on Methods of Chemical Analysis, was held Thursday evening, March 21, in conjunction with the Group Committee Meeting in Chicago, augmented by a number of interested members from Sub-Committees XIV on Silver and Gold Solders and XV on Die-Cast Metals and Alloys, in cooperation with which the present work of the committee is being carried on.

Cooperative analytical work in connection with the methods of analysis for silver solders has been completed and the results reported by the various laboratories were discussed. A tentative draft of the methods of analysis was also discussed.

Work was actively started on methods of analysis for zinc base die casting alloys. Standard samples are being prepared and will be cooperatively analyzed by various methods.

Minor changes in existing standard methods were discussed and will be referred to members of the sub-committee for letter ballot.

Sub-Committee XV, of Committee B-2 on Non-Ferrous Metals and Alloys, on Die Cast Metals and Alloys

At a meeting of the Sub-Committee, of Committee B-2 on Non-Ferrous Metals and Alloys, on Die Cast Metals and Alloys, held in conjunction with the Group Committee Meetings in Chicago, on March 20, the second largely-attended meeting to be held within two months, the committee further completed its arrangements for extensive corrosion tests at nine locations throughout the United States and the Panama Canal Zone of various die-casting aluminum and zinc base alloys. These exposure tests will supplement the very complete mechanical, chemical, metallographic and X-ray studies of these alloys which have made such rapid progress during the last two years.

It is expected that the work of the committee will serve to raise the level of the quality and uniformity of die-cast parts and as such permit the more extensive safe utilization of such inexpensive parts for the many uses to which they are adapted.

The generous cooperation given by both the producers and consumers of these products furnish an unusual example of the great possibilities of cooperative research and specification work of the type which characterizes the Society. Over 70,000 test specimens have already been cast to the committee's specifications by the cooperating die-casting producers and about one-half of these specimens have already been tested.

Outstanding developments of the committee's work to date include unusual showings for soundness of die-cast parts made with certain aluminum alloys as revealed by the X-ray examination and remarkable improvement in physical properties and stability of zinc-base alloys resulting from the use of special high grade zincs.

Large tonnages of die-cast parts are being used by automobile manufacturers, electrical companies, instrument manufacturers and manufacturers of household appliances.

Committee B-7 on Light Metals and Alloys, Cast and Wrought

A very well attended meeting of the new Committee B-7 on Light Metals and Alloys, Cast and Wrought, was held in conjunction with the group meeting in Chicago on March 21. The Tentative Specifications covering Aluminum Base Sand Casting Alloys in Ingot Form and Aluminum Base Alloy Sand Castings, respectively, are being extensively revised in order to bring them up to date and to include a number of new compositions. The specifications are being continued as tentative.

A new Sub-Committee on Magnesium Base Alloys is being organized and plans are under way for the drafting of specifications for magnesium base casting alloys.

With some few minor revisions in the Tentative Specifications for Aluminum Ingot for Remelting and for Aluminum Sheet, rspectively, these specifications will be recommended for advancement to standard at the next annual meeting.

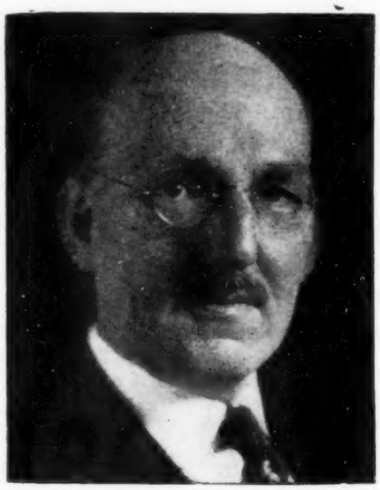
Nickel Solutions

A Contribution from Hanson-Van Winkle-Munning Company Research Laboratory, Matawan, N. J.

By GEORGE B. HOGABOOM

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

THERE is an adage that warns against putting new wine in old skins as the result will be that the wine will be spoiled. When the 95/97 per cent cast nickel anodes replaced the 90/92 per cent cast anodes considerable difficulty was experienced until single nickel salts were used for making electroplating solutions instead of the double nickel salts. With the demand for better nickel plating came the higher purity nickel anode, 99.5 per cent depolarized; and these new anodes have been used in the same solutions that had been developed for the 95/97 per cent cast nickel anodes with the result that considerable difficulty has been experienced by some platers. "New wine in old skins."



George B. Hogaboom

The most trouble is experienced in places where the nickel solutions are not kept under chemical control. The maintenance of all plating solutions should be by chemical analysis. This is the only correct and reliable way to keep plating troubles down to a minimum. The methods of analysis have been so simplified that it is not necessary to have an extensive knowledge of chemistry to learn how to control plating solutions, so the argument that one cannot comprehend the principles of chemistry is overcome. So many have learned the mechanics of analysis and have profited by them that the only reason that every plater is not making use of it is indifference. The cost of equipment cannot be considered as the necessary glassware and the standard solutions for a hundred analyses do not cost as much as a half day's bad work from a 500 gallon plating solution.

Another contributing cause is that all too many platers use the same formula for a plating solution that they have used for the past twenty years and when additions are made no actual knowledge is had of how those additions will act. The purity of nickel anodes have changed; there has been little or no change in solution composition or the proportions of the chemicals used. It is common knowledge that pure nickel is passive in a sulphate solution. That is why, even when 90/92 per cent nickel anodes were used, that addition agents were employed. If addition agents were a necessity then is it not well to study the effect of those or other addition agents when a high purity anode with a tendency to become passive is used? Surely, it is not desirable to go back to the carbon and iron sludge on the anode, at the bottom of the tank and the always cloudy yellow nickel solution. A clean anode and a clear solution means too much to good plating. The high purity nickel anode is here and here to stay, its advantages are essential and the correct nickel solution must and will be found.

When a study is made of a nickel solution all the factors entering its performance must be considered. Not only must the rate of the anode corrosion be ascertained but of equal, if not greater importance is the character of the corrosion. Of what value is a high rate of anode corrosion if the chemical producing that also changes the character of the corrosion and the products formed at the anode are held loosely, to fall to the bottom of the tank, or be carried over on the work causing rough deposits? This is a direct loss of both anode and the quality of the cathode deposit. An addition agent that gives a high anode and a low cathode efficiency is of little value. The anode becomes coated with partially corroded material due to the change (in the case of nickel solutions) of the relation of the acid content to that of the metal in solution. This results in the insulation, or more correctly, the polarization of the anode, and if a definite number of amperes is to be maintained an increased pressure must be used. This increase of pressure causes local anode current density and an increase of gassing at the anode which in turn may do several things; e.g., cause anode disintegration rather than corrosion; bring about a chemical change of the products formed at the anode which may be slightly soluble in the electrolyte; release the sludge formed and which if positively charged will be carried over electrically to the cathode; create an unbalanced composition of the solution which in turn will result in poor cathode deposits—why relate more? sufficient trouble already exists. This condition is to be found in several plating rooms and the high purity anodes are condemned.

Macnaughton and Hothersall* in an investigation of the hardness of nickel deposits used a solution containing sodium fluoride and also one with sodium sulphate. In both of these solutions the electrode efficiencies were low. This led to the investigation here reported of the effect of those addition agents on the corrosion of the anode. From the data obtained it was established that not only was the actual anode efficiency low but that with either salts the character of the corrosion was affected. In a solution free from sodium fluoride or sodium sulphate the coating that formed on the anode was very adherent. When either of those salts was added to the solution the anode coating became loosely adherent and when the cathode was removed, fine particles readily separated from the anode and became suspended in the solution. The subsequent cathode deposits were covered with these fine metallic particles and quite rough. Throughout a run for several days it was not possible to obtain a deposit free from roughness. The anode looked clean but upon close examination it was found to have at all times fine particles of metallics on it. A quantity of nickel solution was obtained from a commercial plant where the depolarized anodes were stated to be the cause of rough deposits. A run of several days was made with 9 litres

* The Hardness of Nickel Deposits. D. J. Macnaughton and A. W. Hothersall. Electroplaters and Depositors Technical Society (England), November, 1928. Brass World, December, 1928.

Experimental Laboratory, Hanson-Van Winkle-Munning Company, Where Platers Are Taught the Mechanics of Analysis

Research Laboratory Experimental Tank with 4-Wire System Permits a Range of Voltage from 2 to 2½ Volts

of this solution and rough cathode deposits were always had. The anodes coated over with loosely adherent particles. The anode efficiency was found to be 99.8 per cent; the cathode efficiency, 79.8 per cent. The apparently high anode efficiency was not a true efficiency. The amount of metal lost was that which went into solution and that included in the sludge formation which fell off when the anode was removed. The metal content of the solution did not increase. That would seemingly indicate good anode efficiency and is often taken as such by some platers. As the metal content of the solution remained constant and the cathode efficiency was 79.8 per cent it indicated that 20 per cent of the metal lost by the anode fell to the bottom of the tank as sludge and fine metallics. That solution contained both sodium fluoride and sodium sulphate and it is quite certain that their effect upon the character of the anode corrosion was the cause of rough deposits.

It is known that a chloride is a good addition agent to aid anode corrosion. Arguments have been advanced that a chloride in a nickel solution would cause iron to be deposited with the nickel and destroy, in a measure, the protective properties of the nickel. †M. R. Thompson showed conclusively that this danger was not as great as had been stated. He used 95/97 per cent cast nickel anodes. With anodes containing 99.5 per cent of nickel and less than 0.2 per cent of iron the probability of having an appreciable amount of iron in the deposit is remote. It should, therefore, be a good practice to use a chloride in a nickel solution when high purity anodes are used.

Upon calculating the amount of chloride that has been recommended for nickel solutions it was seen that a peculiar condition existed. In a cold solution where the current density is low and consequently a small amount of nickel is taken from the solution a high chloride content is recommended, e.g., two ounces of ammonium chloride. That salt has, in round numbers, 60 per cent chloride, therefore, the chloride content of each gallon of solution is 1.20 oz. In the well known warm nickel solution, 3 oz. of nickel chloride is recommended for a gallon of solution. That salt contains approximately 25 per cent chloride, therefore, in each gallon of solution there is 0.75 oz. of chloride. In the warm solutions high current densities are used and the amount of metal that should go into solution from the anode should be greater than that required to maintain the metal content of a cold solution. Yet, in the warm solution the active agent for obtaining good anode corrosion is lower than it is in a cold solution. It seemed quite probable that this condition should be reversed.

A solution was made containing:

Nickel sulphate	28.5 ozs. per gal.
Nickel chloride	6.0 " " "
Boric acid	3.0 " " "

It will be noticed that the total metal content is the same as that of the well known warm solution. No data is available to indicate what the optimum metal content of a nickel solution may be and it was deemed advisable to adhere to what has been used successfully for a number of years.

Anodes which previously had been coated over with a dark slime and corroded roughly (Fig. 1) came down smoothly and clean and bright during a run of 96 hours (Fig. 2) in this solution. A cathode current density of 20 amperes per sq. ft. was used. The temperature of the solution was 120° F. A new 99.5 per cent depolarized anode was placed in the solution given above and run for 240 hours. This anode remained clean and bright during the whole run (Fig. 3). The metal content of the solution remained constant and there was a change in the pH value of only 0.1. The cathode efficiency was 99.7 per cent. The character of the deposit was excellent.


Fig. 1—Low Chloride Warm Solution


Fig. 2—High Chloride Same as No. 1 Warm Solution

The effect of the higher chloride content in a cold solution was equal in results to that obtained in a warm solution. It was not deemed advisable to increase the ammonium chloride content as the solubility of the nickel sulphate would be affected, consequently addition was made of an equal weight of nickel chloride.

The solution contained:

Nickel sulphate	14 ozs. per gal.
Nickel chloride	2 " " "
Ammonium chloride	2 " " "
Boric acid	2 " " "

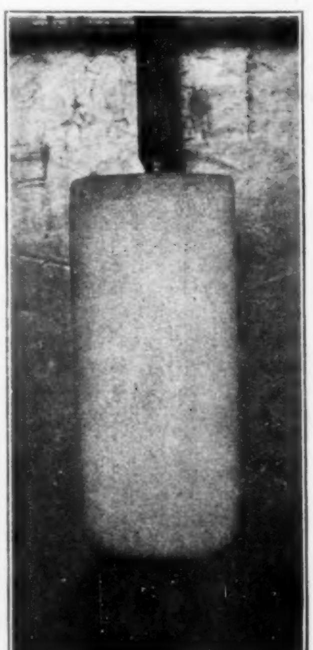


Fig. 3—High Chloride Warm Solution

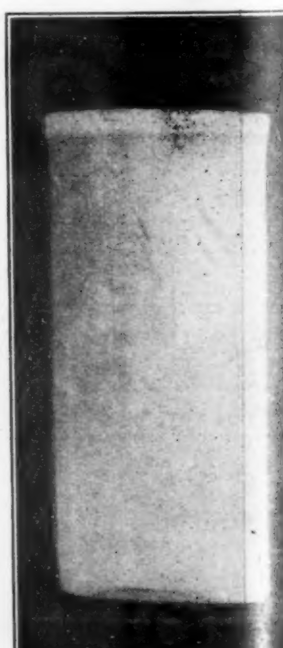


Fig. 4—Cold Solution with Boric Acid

† Transactions American Electrochemical Society, Vol. 44, 1923.

The anode in this solution did not coat over and was clean and bright after several days' run (Fig. 4). The metal content of the solution did not change and the pH remained practically constant. It is realized that these ideal conditions as to metal content and pH values would not have been had in large plating solutions in a commercial plant as the drag-out would cause some slight change.

Two runs were made of a solution of the same composition as that given for a warm solution except that the nickel chloride was left out. This was to see what value a chloride had in a warm nickel solution. The results were very interesting. Runs of 48 hours each were made in separate tanks. In the first run the anode efficiency was 20.8 per cent; the cathode efficiency, 70.9 per cent. In the second run the anode efficiency was 41.9 per cent and the cathode efficiency 74.1 per cent. The increase in anode efficiency in the second run was not understood until an analysis of the nickel solution was made when it was discovered that it contained 0.06 oz. of nickel chloride per gallon. This chloride was traced to the nickel salts used which had become contaminated. These results did, however, illustrate clearly the effect of a chloride, even in small amounts, on the anode efficiency.

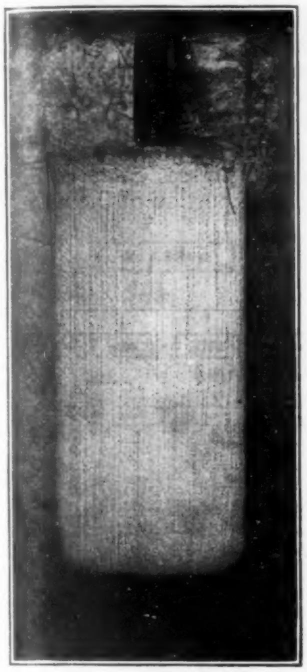


Fig. 5—Warm Solution Without Boric Acid

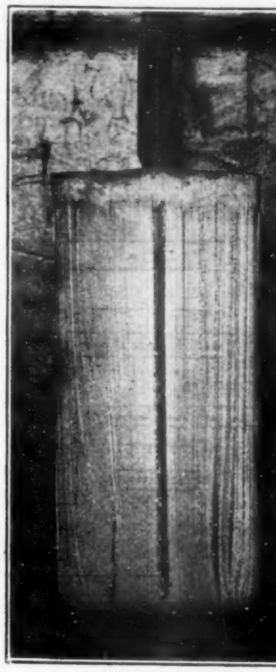


Fig. 6—Cold, Without Boric Acid

In these runs the change in pH values was very rapid. In a 5 litre solution 150 c.c. of aqua ammonia 26° Bé. had to be added in a 24 hour run. Even then it was not possible to maintain a pH value anywhere near constant for more than two hours. In the high chloride solution, run warm, there was an increase in pH of 0.1 in a 10 day run; in the high chloride solution, run cold, the increase was 0.3. When no boric acid was used the change in pH value in this investigation was no greater than when it was not present. There would be in all probability a change if a large plating solution was used.

The general opinion among platers has been that with a higher chloride content in a nickel solution the metal content of the solution would increase. It was found in several runs that the rate of the corrosion of the anode is not increased but that the character of the corrosion of the anode is materially changed. When the nickel solution contained no chloride a hard black film covered the anode. In the solution containing 3 ozs. of nickel chloride per gallon there was a black spongy coating. With 6 ozs. of nickel chloride per gallon the anode remained clean and the corrosion was even which resulted in a smooth surface on the anode. These results were confirmed with depolarized anodes, in a commercial run of almost two months in a 12,000 gallon warm nickel solution in which the increase in chloride content given above had been made.

This investigation would not be complete unless the effect of the other addition agent used in the nickel solution recommended—boric acid—was investigated. One of the needs of analytical methods for the nickel solutions is a simple and rapid method for the determination of the boric acid concentration. No attempt was made to maintain the boric acid content at a constant value in this work. The results were of interest in that there is an indication that the character of the corrosion of a high purity nickel anode in a nickel solution is different from that obtained when no boric acid is used.

In both cold and warm solutions without boric acid the anode became covered with grooves extending from the bottom to the top. In warm solutions this effect (Fig. 5) is less than in cold solutions (Fig. 6).

From this investigation, it is evident that both good anode corrosion and high cathode efficiency can be had when a high chloride content is maintained and boric acid is used. The change in metal concentration and pH values is much less than in nickel solutions where the chloride content is low.

The System Magnesium-Zinc*

By W. Hume-Rothery and E. O. Rounsefell

The equilibrium diagram of the system magnesium-zinc has been investigated in the range 0 to 70 atomic per cent magnesium, the magnesium-rich alloys having already been studied by Hansen. Particular attention has been paid to the structure of the solid alloys and the limits of solid solution in the various phases.

On the practical side the present work shows that in Electron metal, and similar alloys, any zinc present in excess of that contained in solid solution in magnesium will exist in the form of the new compound MgZn, and not, as previously supposed, as $MgZn_2$.

The relations between the magnesium-zinc and magnesium-cadmium diagrams are discussed. Both contain analogous rather unstable compounds, $MgZn_2$ and $MgCd_2$, but whilst the Mg–Cd system contains wide solutions in the parent metals, the Mg–Zn system shows little solid solubility in the two metals, but forms two very unstable compounds, $MgZn_5$ and MgZn. Evidence is given indicating that these may exist in the solid state only, and not as definite molecules in the liquid. It is shown that concurrently with these facts the atomic volumes of magnesium and cadmium are nearly equal, but differ widely from that of zinc. It is suggested that where two metals form one principal but rather unstable compound, the atomic volumes are one of the chief factors in determining whether wide solid solutions are formed in the parent metals or not.

*Abstract of a paper read at the meeting of the British Institute of Metals, a full report of which will be found on page 169 of this issue.

The Story of Lacquer

Its Derivation—How It Is Made—How It Acts

By KENNETH E. BURGESS
Zapon Lacquer Company

FROM THE MONTHLY REVIEW OF THE AMERICAN ELECTROPLATERS' SOCIETY, FEBRUARY, 1929.

LACQUER and lacquer enamels consist essentially of five divisions: 1. nitrocellulose; 2. solvents and diluents; 3. resins; 4. plasticizers; 5. pigments or dyes.

Nitrocotton, whether the most common nitrocellulose, is made by treating cotton linters with a mixture of nitric and sulphuric acid. The cotton linters are derived from the small fibers adhering to the cotton seed after the long fiber has been picked off by the cotton gin. The seeds are sent to the cotton seed mill where these short fibers are shaved off by machines resembling a many bladed band saw.

The linters are delivered in bales and are treated with a caustic solution to remove traces of oil and woody fiber and then with clorine compounds to bleach them to whiteness.

Sulphuric acid is manufactured from pure sulphur. The principal source of sulphur is the large sulphur beds around the Gulf of Mexico. The sulphur occurs in deep lying beds and is mined in an ingenious manner by pumping superheated steam down to the bed and forcing the resultant liquid sulphur to the surface.

Liquid sulphur is run into large bins where it hardens and is afterwards broken up for shipment, north. The sulphur is burned in a large rotary converter and the resultant sulphur dioxide purified through towers and asbestos-packed columns. It is then forced over compartments containing platinum precipitated on magnesium sulphate. At high temperatures the platinum has the ability to cause the sulphur dioxide to unite with additional oxygen, forming sulphur trioxide. This sulphur trioxide gas is then absorbed in weak sulphuric acid, bringing the strength of the resultant sulphuric acid up to ninety eight to 110% H_2SO_4.

The most common source of nitric acid is from sodium nitrate or Chile saltpeter. This material occurs in the arid rainless regions of South America. The material is leached out, crystallized, and shipped for consumption.

The most common method is to treat a large amount of nitric with an equal amount of sulphuric acid ninety-eight per cent, in a large cast iron retort. Retort is either oil or coal fired.

The nitric oxide vapors distill off and are condensed either in chemical or glassware, or in the many acid-resisting alloy systems. Nitric acid is delivered to large tanks containing sulphuric, where it is thoroughly mixed with the sulphuric, forming the mixed acid.

The nitrating of the cotton linters is a very exact chemical operation. The temperature, time, total acidity of the acid, and the ratio of the nitric to the sulphuric must be accurately determined and maintained.

Recently there has been a great advance in the manufacture of nitric acid from the nitrogen of the air. The nitrocotton is introduced in an agitated nitrating tank holding about 1500 lbs. of acid to thirty-five pounds of cotton. It is nitrated usually for about twenty-five minutes, and the average temperature is 35° C. After nitration the entire charge is dropped into a centrifugal where the excess acid is extracted. The nitrated cotton is then dropped into a drowning tank where the remaining acid is completely diluted so that no further action takes place. It is then transferred to large wooden tubs where repeated boilings break down the unstable compounds and give a stable nitrocellulose. These boiling tubs are compounded in a larger blending tub to give a batch of uniform viscosity, stability, nitrogen, content, etc.

The nitrocotton is pumped from the boiling tubs to a battery of centrifugals where the excess water is extracted. Before its use in lacquer, it is necessary that this water be removed. Drying the nitrocotton would effect this nicely but, of course, this is extremely dangerous. The standard practice is to replace the water with alcohol and can be carried out either in a hydraulic press or in an extraction tub. Hydraulic presses compress the water-wet cotton, forcing out a large portion of the water.

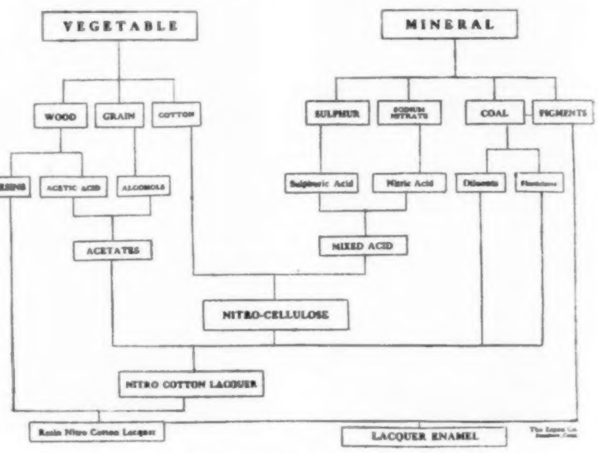


Chart Showing Derivation of Lacquer and Lacquer Enamel

While still under pressure, denatured alcohol is pumped through the nitrocotton mass and the alcohol thoroughly displaces the water.

A simpler method is to fill the tub with the nitrocotton and run in alcohol until the whole mass is saturated and a layer of perhaps two feet of pure alcohol above the nitrocotton. The bottom drain is then opened and the liquid then run off, carrying the water with it and leaving the nitrocotton wet with pure alcohol. The excess alcohol is once again extracted in the centrifugals. The nitrocotton is now ready for delivery to the lacquer plant.

The simplest lacquer consists of a nitrocotton dissolved in a solvent, which brings us to the second division. The principal solvents are acetates of the various alcohols. That is, ethyl acetate, butyl acetate and amyl acetate. These acetates are made by the action of acetic acid upon the corresponding alcohol, process of which is either intermittent or continuous.

The usual acetic acid is the calcium acetate derived by treating pyroligneous acid, obtained from the distillation of hard wood with milk of lime. This calcium acetate is acted on by sulphuric acid in the presence of the alcohol, with the addition of heat. The sulphuric acid liberates the acetic acid, which unites the alcohol, forming the corresponding acetate. This acetate is further refined for color and constant boiling range.

Other well known solvents are acetone derived from wood products and methyl alcohol derived from the same source. Recently a number of synthetic products are finding favor in lacquer manufacture.

In making lacquer, however, it is not necessary to use 100% solvent, as twenty-five to fifty per cent solvent is

sufficient to disperse the required nitrocotton. Consequently known solvents or diluents are employed. These consist mainly of the alcohols such as ethyl alcohol or butyl alcohol and the hydrocarbon series such as benzol or toluol.

A lacquer made of nitrocotton and solvent only gives a tough film but with small building power and comparatively low adhesion. In order to obtain additional building power and additional gloss it is customary to make a mixed lacquer by adding solutions of certain resins to the nitrocotton lacquer. These resins are in the main the common resins in varnish manufacture, such as copal, Kauri, Damar, and shellac.

Resins are generally hardened residue from the sap of certain bushes or trees. Shellac, however, has a rather interesting history being the exudation of a certain type of insect, which feeds upon the sap of a tree in India. The insect in certain seasons of the year feeds very rapidly and throws off this exudation in the form of a hard crust. This crust hardens to the trees, is broken up, washed, remelted and shipped to this country as the shellac of commerce.

Kauri resin is the exudation of prehistoric trees; this exudation having lain buried in the ground for many thousands of years and is now mined principally in Australia and New Zealand.

These various resins impart additional body and building power without noticeably increasing the viscosity and gives greater gloss and adhesion. For many purposes, however, these resins for nitrocotton lacquers are too brittle and a plasticizer is added as a softener. These plasticizers are usually of two types, one a latent solvent with pyroxylin, and the other usually an oil type which forms colloid with the nitrocotton, giving additional flexibility. The principal ones in use are lindol and dibutyl phthalate and in the oil class, castor oil.

In making an enamel, pigments are ground in the lacquer to give covering power and coloring. There are three methods of grinding pigments, in a pebble mill, a Buhr mill and the steel roller mill. The pebble mill is a cylindrical steel jacket lined on sides and ends with porcelain bricks and filled half full of hard flint pebbles. The cylinder revolves on trunnions and the material is ground by the many contacts formed by the pebbles rolling against each other and against the porcelain sides. This method is particularly suited to lacquer as the cylinder can be closed and there is no loss by evaporation.

The Buhr mill operates by the grinding action of two stone mills revolving against each other in counter directions. This method gives good fineness but care must be taken to prevent evaporation. Steel roller mills are similar to the Buhr mills except that there are usually three steel rolls revolving each against the other in counter directions, and the material is ground at the point of contact.

Having traced the flow sheet of lacquer it perhaps would be interesting to discuss its physical, chemical nature.

When nitrocotton is added to a solvent, it rapidly disappears and it is only natural curiosity to ask ourselves in what state the nitrocotton now exists. We have seen it as a white fluffy material and now it has entirely disappeared, leaving a clear colorless solution. Evidently nitrocotton has been dispersed into particles too small to be visible to the eye. We at once wonder just how small these particles are, and what is the ultimate size possible.

The smallest particle we can conceive must have a front, back, top and bottom, and therefore be capable of further division. The smallest material unit whose existence as separate entities thus far have been experimentally proven are the electrons, the individual particles of negative electricity which revolve around protons or individual particles of positive electricity which combined make the atom. The combinations of atoms form the molecule and the combinations of molecules form the various states of matter with which we are more readily familiar. The size of protons and electrons are so small that it is difficult to conceive them.

The atom is comparatively much larger but still in the realms of the unseen, the size of an atom being 1/10 to 6/.0 of a millimicron; a millimicron being one-millionth of a millimeter. A molecule is 2/10 of five millimicrons.

The smallest particle visible to the naked eye is about 20,000 millimicrons so that between the molecule and visible particle there is an extremely wide range in size.

If you dissolve salt or your more familiar nickel chloride you get a solution of certain definite physical characteristics, the principal one being its electrical conductivity. This conductivity being due to the fact that the dispersion of the solid nickel chloride has gone so far that the particles are dispersed to an atom or an ion size. On the other hand, a solution of sugar dissolved in water is not a good conductor of electricity because it has only been dispersed to the molecular size.

These are the two general types of dispersion and these dispersions have very definite characteristics dependent mathematically upon the amount of material dispersed in the solution. However, as we stated before, there is a wide range in size of particles between the limit of visibility and the molecular dispersion and it is in this range that the nitrocotton lacquer falls.

Nitrocotton dispersion in solvent does not reach the molecular dispersion but remains in that space mentioned before, and which has been given the name of "colloidal" state of matter. Unfortunately colloidal state of matter is not as definite in its characteristics as the other states, the principal difficulty being in viscosity. The viscosity of a nitrocotton dispersion is not at all dependent on the amount of nitrocotton dispersed in solvent. A one-ounce nitrocotton solution may have the same viscosity as a ten-ounce, provided they have been properly nitrated.

As we stated before, the control of the nitration of cotton must be very carefully maintained and it is this function of viscosity which is the main reason. Formerly it was impossible to make a nitrocotton solution with more than 8/10 ounce of nitrocotton per gallon on account of excessive viscosity. Recently, however, by physical and chemical treatment nitrocotton is produced which will disperse so readily that solutions of twenty to thirty ounces of nitrocotton are quite feasible and common. This was the discovery that opened the automobile and furniture fields to lauquer.

The resins exhibit the same phenomenon, although to a less extent, as the dispersion of the resin is undoubtedly more complete than that of the nitrocotton. It is this colloidal state of matter of lacquer that explains some of its interesting phenomenon, the most striking of which is the tendency of lacquer to blush sometimes in extremely humid weather. This is caused by the evaporation of the solvent and diluent.

In passing from the liquid to the vapor state they take up heat from the atmosphere immediately above the lacquer film. The air therefore becomes chilled quickly and if it contains any amount of water vapor this water vapor is permeated into the still liquid lacquer film. Water does not have the power to disperse nitrocotton, not only that but it actually neutralizes the dispersing power of the solvent, so that the nitrocotton particles instead of remaining dispersed rapidly come together until as the size of the particles increase it becomes a solid white sheet and precipitates out from the lacquer film giving the whitish blush. This, of course, can be prevented by a slower evaporating solvent which does not take the heat from the air so quickly but allows the air currents to keep air above the film mixed with the drier air above it.

Development and Future of the Non-Ferrous Ingot Industry

How Ingot Making from Secondary Metals Has Grown—Its Difficulties and Prospects

By G. H. CLAMER
President and General Manager, Ajax Metal Company

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

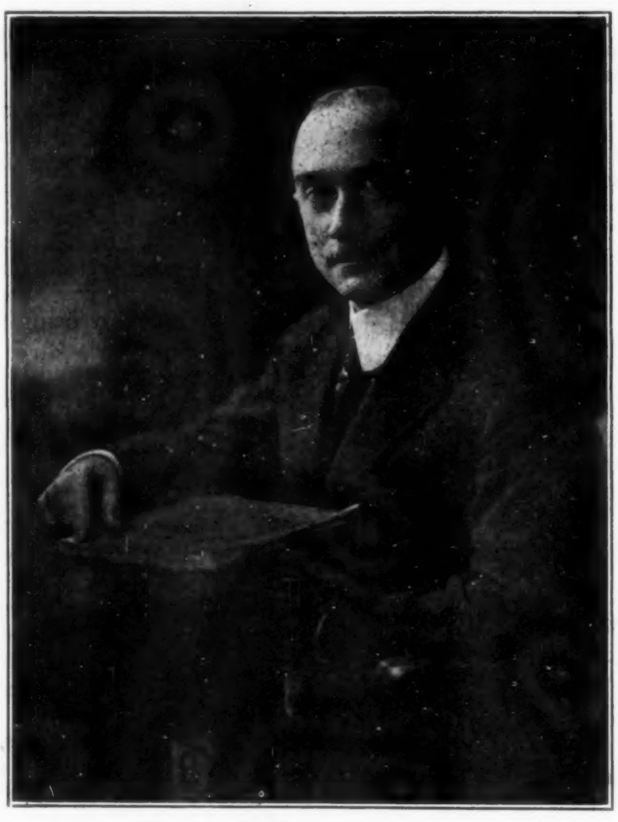
IN the early days of the ingot manufacturer, practically no attempt was made to refine or to produce alloys to a specific formula. Yellow brass ingot was the first to appear on the market. It was found that yellow brass ingot, made from various kinds of light and bulky scrap, turnings, pin dust, etc., could be sold at a profit. The use of scrap material such as this by the foundryman was practically prohibitive because of the trouble, time and space involved in handling it.

The ingot producer melted such material in fairly large size clay-graphite crucibles in pit fires. By keeping the temperature sufficiently low and by constant attention to charging and "puddling" it was possible to hold down metal losses to a fairly satisfactory figure. After the crucible was almost completely filled with metal in a rather pasty state of fusion, the temperature was elevated to such degree that the metal could be poured into open ingot molds. When raw material such as grindings or washings was used, it became necessary to add fluxing materials in order to flux the contained gangue.

The above described method to a limited extent is still in use. In the beginning the class of material used in the manufacture of ingot was purchasable upon a much greater differential as compared with the cost of virgin metals than is possible today.

The next step was to produce red brass ingot by the crucible process. The procedure was to simply melt a mixture of red turnings and red brass scrap, and when available, red brass washings and other material of lower value for metal contents than turnings and solids. The commercial designation "Red Brass Ingot" was applied to any ingot just so long as it had a red color. There was no attempt made to produce alloys to any particular specification, and the grades intermittent between red and yellow had not yet made an appearance. The chemist was not then in control; chemical analysis in the industry was hardly known, and was not used in a commercial way.

There was also produced in ingot form alloys for bearings, anti-acid metal and a few special alloys for specific purposes. Manganese bronze ingots were on the market, but the use of manganese bronze was then confined to the shipyards and the navy yards. The bearing metal ingots were sold under trade names and were made with virgin metals.



G. H. Clamer

Beginning approximately 1900, the direct use of scrap metals became more and more uncertain due principally to the ever-increasing use of aluminum in the industry, and the fact that the scrap became largely contaminated with it. This, combined with the more diversified range of specifications used, has resulted in the present red brass scrap pile being of very uncertain quality for direct use in the foundry. In bearing metal scrap there has been a cumulative addition of antimony. In addition to this the contamination of red brass scrap by aluminum bronze is ever on the increase. Today it is nothing unusual to have large lots of otherwise fine red brass scrap spoiled by the aluminum thus introduced. There is also a constantly increasing mechanical admixture of iron in the existing scrap due to the substitution of iron for brass in many structures. The iron that is not mechanically removable can only be removed by an oxidizing refining operation, as is true also of aluminum and other metals of relative electro-positive nature as compared with the main constituents of the scrap.

At first a few of the ingot manufacturers met the demand for specification ingot by confining their raw material, of which the ingot was made, to turnings and borings. These, because of their relatively finely divided state, could be mixed into heaps and by the usual mixing and quartering process, it was possible to get each lot into a relatively uniform state. The sample taken by the quartering method was then melted and analyzed, and the turnings plus the required additions of material of definitely known composition, particularly scrap metals of an elemental nature, made it possible to produce ingots to definite specifications and of satisfactory quality. Turnings that showed aluminum were re-

jected. The iron that existed as mechanical admixture was removed in magnetic separators.

The next step was to resort to the practice now almost universally used today, namely, of producing ingot in large batches in the reverberatory type of furnace. In such a furnace it is possible to charge directly, scrap of varying composition, turnings as well as solids, and by a rough control to hit fairly well the desired composition by mere melting. Aluminum, iron, manganese and phosphorus are quite easily eliminated by oxidation, whether by air alone or by oxidizing fluxes. A sample of metal is taken by means of a ladle; this sample is analyzed by rapid analytical methods, and the metal then "built" to the formula by the required additions. In the case of high lead alloys, namely, those of approximately 10 per cent of lead and over that are used for bearings, anti-acid purposes, etc., the oxidizing process is further prolonged until the zinc is reduced to below the specified maximum allowance. Applying an air blast over or beneath the surface of the metal is frequently resorted to. In the reverberatory furnace it is possible to use washings that carry a considerable amount of gangue, grindings, radiators and other low grade scrap. If the charge contains gangue it must be fluxed by proper fluxing materials.

The art of ingot manufacture has developed along the lines of using larger melting units, whereby it becomes possible to use low cost mixtures and perform the necessary fluxing or oxidation, and for each unit batch to absorb imposed charges for cost of chemical analysis, refining and building to formula without too greatly increasing the cost of product.*

The non-ferrous ingot industry, by which I mean that industry which conducts the manufacture of refined alloys in ingot form to definite specifications and sells its product at a price sufficiently below the virgin metal mixture cost to thereby make the purchase of the same attractive, came into existence only about twenty-five years ago. The economic reason for the existence of the non-ferrous ingot industry is due primarily to the fact that a saving is affected by the use of ingot as compared with using virgin metals. Furthermore, with present day refining methods, scrap metals are converted into alloys that are satisfactory in every respect, resulting in the production of castings lower both in first and end cost than if virgin metals were used, and in end cost if produced directly from scrap. These two factors have, therefore, been responsible for the building up of an industry which today has assumed one of great importance. The combined output of the industry last year was approximately 230,000,000 pounds (a relatively dull year) having an approximate valuation of $32,000,000. These figures will be greatly exceeded during the present year.

I have frequently heard expressions of doubt regarding the future of the ingot industry. These doubts were based primarily on the possibility of casting manufacturers going to the direct use of scrap, the argument being "Why cannot the foundryman follow the practices of the ingot producer and thereby save the re-melting cost and the ingot producer's profit?" As I view it, the ingot industry is primarily built upon a foundation of economic advantage to the consumer, and such being the case, its future success is assured. Here is the situation:

Scrap Is Accumulated—It Is Not Produced

Quite a different situation, therefore, than depending on nature's ore reserves. The only practical method for accumulating scrap is through the efforts of the junk man, first the small peddler who sells to the small junk man, then the small junk man who sells to the large junk dealer, then the large junk dealer who sells to the ingot producer. These are the channels through which the greater portion of junk is accumulated. Many large manufacturing establishments produce turnings and scrap. Such accumulations usually go direct to the ingot producer, or possibly if the scrap is of such quality as to make its economic use possible, it may go directly to the foundry. Only a relatively small proportion of the scrap purchasable is fit for direct use in the foundry. Usually the large manufacturer who accumulates turnings or scrap as a by-product, also operates a foundry, and such accumulations therefore find their way back into the manufacturer's product. (I am excluding from consideration scrap suitable for use in the wrought brass industry.)

As scrap is accumulated and not produced, and is accumulated from a limited supply source, the purchase of the same becomes highly competitive. This highly competitive condition has resulted in developing the present practices in the junk business. These practices briefly stated are the following:

(1) Supply sources are sought by the purchaser, namely, he sends his buyers as a rule to see the vendor, instead of the vendor offering his goods to the buyer. If the vendor has not sold his goods to a visiting buyer, when he has an accumulation he invites competitive bidding.

(2) The vendor almost invariably accumulates all sorts of scrap and does not care to sell selected lots. If he sells selected lots he sells them at a premium price. The ingot manufacturer must be in position to purchase entire accumulations instead of selected lots.

(3) The junk business is conducted on a practically cash basis.

The ingot producer has the following important functions to perform:

(a) Specialized purchasing requiring skilled buyers.
(b) He must handle all kinds of non-ferrous scrap.
(c) He must maintain a competently manned Sorting Department for proper sorting.
(d) He must have a trained technical organization for control of purchasing product.
(e) He must produce with profit to himself metal of highly satisfactory quality, capable of being sold at a price sufficiently below virgin metal cost to make the purchase of the same attractive to the user.
(f) Due to the competitive scrap purchasing conditions, the scrap business is conducted largely upon a cash basis, whereas non-ferrous ingots are sold on a 30 days' basis. In exceptional cases sixty and even ninety days' credit is extended. The almost universal practice in the sale of virgin metals in carload lots is upon a cash against documents basis. No such practice exists in the non-ferrous ingot trade because of competitive selling conditions. Because of the above, the non-ferrous ingot manufacturer must be equipped with a large amount of working capital.

To properly perform the above functions he must have a large plant investment because he must produce in large furnace units and have a large output to produce economically.

It is very doubtful if even any of our largest non-ferrous foundries could perform the above functions and thereby effect a saving as compared with purchasing highly refined ingot metal. To be relieved of all the ingot maker's troubles and devote his attention exclusively to the production of castings is a sufficient job for the

* A limited tonnage is still produced by the crucible method. The quality of ingot so produced is dependent almost entirely upon the quality of the scrap melted.

foundryman. The ingot maker's functions are decidedly specialized.

In addition to the above functions, some of the larger ingot producers offer technical services in connection with foundry problems. With such functions or service to perform, in order to produce a satisfactory product capable of being sold at a profit upon an attractive end cost basis to the producer of castings, I predict a bright future for the industry.

During the past year there was organized the Non-Ferrous Ingot Metal Institute. The following is a statement of the objects of the Institute as embodied in the Constitution:

(1) To improve and develop the business of manufacturing non-ferrous ingot metal, to study and consider the various phases, and to endeavor to solve the problems which arise in connection with raw materials and with the making and distributing of non-ferrous ingot metal.

(2) To accurately inform and educate buyers and consumers regarding the use, quality, grades and merits of non-ferrous ingot metals; to cooperate with customers and all other persons who are interested in encouraging and further developing the manufacture of and creating new uses for such metals.

(3) To cooperate with customers in the adoption and maintenance of uniform and high standards and specifications in the manufacture of such non-ferrous metals, so that customers may be guaranteed the character and quality of the same. Also, with the assistance of the members' customers, to endeavor to effect savings in the industry by standardizing and simplifying the grades and specifications for such metals.

(4) To promote a high standard of business ethics in the industry; voluntarily to aid in the prevention of unfair competition and the elimination of trade abuses in the industry, and otherwise to aid in establishing just and equitable principles among the members and their customers.

(5) To devise a scientific system of cost and accounting procedure, to the end that every one engaged in the industry may accurately know his cost of manufacturing such metals. It is not the purpose of the Institute to impose upon any member any cost items, or to adopt uniform and standard costs to the exclusion of individual costs.

(6) To improve the relations between labor and its employers in the industry.

(7) In order that the production and market conditions may be accurately known, to collect from within the industry and distribute such statistics as may be provided for in an appropriate reporting plan, regularly approved by a majority of the members, including credit data which will be just and fair to customers, and, at the same time, give those engaged in the industry prompt and dependable information regarding the financial responsibility of purchasers.

(8) To make researches into the technical problems of manufacture and utility of non-ferrous ingot metal to the end that the future of the industry may be safeguarded and the markets for the materials extended.

(9) To hold meetings at such times and places as may be designated by the Executive Committee, or as may be specially provided for in the By-laws, for the purpose of discussing and acting upon matters pertaining to the industry, and transacting such business as may properly come before such meetings.

Through group effort it is quite reasonable to predict that the non-ferrous ingot industry will, through cooperation with the consuming interests, continue to improve its products and to safeguard prices so that the ingot industry shall continue to develop along the path of sound business policies.

Prior to the formation of the Non-Ferrous Ingot Metal Institute a movement was started in the American Society for Testing Materials, having the following objects:

(1) To make a complete investigation of all the alloys now in use and of the possibility of reducing the number in use with its attendant advantages to both the producer and consumer.

(2) To set up standards of quality for those alloys recommended as standards.

(3) Basing trade paper quotations on the standards adopted.

The Non-Ferrous Ingot Metal Institute was invited to join in this movement and the Institute has pledged its whole-hearted support. This movement is now satisfactorily progressing.

Anodes Dissolve Unevenly

Q.—We have run into some difficulty in the use of pure silver anodes for plating. The silver anodes are dissolving unevenly, rather honey-combed. On some spots of the anodes the original surface showed that the anode had not been attacked at all, and right next to it the anode is almost dissolved through. To make sure that nothing was wrong with the anode the hard spots that had remained undissolved were assayed for any impurities. The assay showed the silver to be 999 plus, so the difficulty is not there.

Suggestions have been made of a short circuit, but the operator says that this could not be, because the generator would indicate it very quickly. The question was brought up of not having the solution up to normal, either with cloride or cyanide. The operator contends that the solution is up to normal. The fact remains that the anode acted in this peculiar manner and we would appreciate any advice. We use a one hundred gallon tank measuring twenty inches by forty-seven inches by thirty inches deep. This is the first time we have had an experience of this type.

A.—Analysis of your silver solution is as follows:

Silver	4.61 oz.
Free cyanide	5.06 oz.
Carbonate content	20.2 oz.

The metal and free cyanide content of the bath are right, but the carbonate content is high and it is due to this factor that the anodes dissolve so unevenly.

The best method to remove carbonates is to freeze them out; that is, lower the temperature of the solution. When the temperature is reduced to 30° F., the carbonates crystallize and can be separated from the solution.

Another method is to precipitate the carbonates by adding barium cyanide to the silver solution and then filtering the solution. In this method, barium carbonate and sodium cyanide are formed. —OLIVER J. SIZELOVE.

Metals in British Air Engines

The new water-cooled engine for airships manufactured by Rolls Royce in London, contains a considerable quantity of metals. The two sets of six cylinders are cast of aluminum in a block. Forged aluminum pistons and phosphor bronze bushings are used.

THE METAL INDUSTRY

With Which Are Incorporated

The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

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Editorial

Today's Metal Business

The gyrations of the New York Stock Market are a very poor indicator of the day to day progress of business, but that institution is now so large and commands such a large part of the attention and credit facilities of the United States, that it is impossible not to notice the latest crash in March. Not that we are interested especially in whether stocks rise or fall on any given date. Our question is "How does it reflect business and what will it do to business?"

It seems to be the general concensus of authoritative opinion that the sharp fall in prices does not reflect present business conditions. In metals particularly, most of the large consuming industries are going ahead at capacity. The electrical trades and automobiles are busy to the utmost. The railroads, while still very poor buyers, are taking more than their share of metals in their electrification programs. Novelties, jewelry and kindred lines are doing well Aside from the building industry, the above activities form the backbone of metal consumption.

The building situation should be scrutinized with great care. While the stock market may not indicate present business conditions, it does affect them by increasing the cost of credit. Bankers have looked upon this condition with apprehension and the first industry to feel the affect of the money stringency has been building. According to a report from a large real estate bonding house, building construction in February, 1929, showed a loss of approximately 20 per cent from February, 1928. It was especially noteworthy also that on one large building project in New York, financing was done by securities which participated in the profits of the building, rather than by mortgage. In other words, investors were asked to take stock rather than bonds or other certificates of debt.

The point at issue for metal manufacturers, therefore, is that building is not making new records. Whether it is being held back by high money or by a surplus of completed construction is an open question. But explanations are less important than the facts.

The metal trades as a whole are in good condition, but those largely or wholly dependent upon building must move cautiously at this time. Other lines, we can only hope will not be injured by the inordinate demands made upon money by speculation.

The Profits of Foresight

The term "good management" is loosely used and may be, in any particular case, quite meaningless. Companies and individuals may earn profits due to such a variety of reasons that no generalizations can be made on the basis of profits or losses alone. Occasionally, however, we are shown an example of a carefully planned campaign to overcome adversity and to put an organization on the right track. If this campaign succeeds in spite of difficulties, which are always present; if the possibility of failure is reckoned with and allowed for, and if the results of success are not merely a short-lived rise, then this procedure can be called good management.

Such an example is present in the work of the International Nickel Company. A few years ago, sixty per cent of its business was eliminated by the stoppage, for practical purposes, of the building of naval armament. Now almost all of its business is in industry. This change was no accident. The first step was the building of a research and development department to find new uses for nickel and nickel alloys. In the hands of capable workers and directors, possibilities were discovered. These were taken up and capitalized by the business departments, sales, advertising and others.

We need do no more than state the results. According to a report by R. S. Stanley, president, sales of metallic nickel in the United States were 97 per cent higher than similar sales during the previous year. Sales of Monel metal (the natural high nickel alloy mined by the company in Canada) increased 35 per cent during the same period. Translated into earnings, these figures resulted in the most profitable year in the history of the company with the exception of one year of war peak earnings.

It is not a program that everyone can follow step by step. It calls for large resources, great courage and capable direction. It is, however, an object lesson to be studied by all large concerns and many small ones.

Shorter Working Time

In an important paper recently read before the Taylor Society by H. S. Person, managing director, extraordinary suggestions were put forth concerning a comprehensive approach to the problem of the shorter work day and the shorter work week. According to Dr. Person, the standard length of the work period should be governed primarily by the maximum amount of work scientifically determined that workers can do and thrive under.

We have witnessed in recent years a gradual shortening of the work day and the work week, largely as a

result of improvements in technology, that is, more efficient machines and methods. The suggestion has been made by a person no less important than Henry Ford that there should be still shorter work periods because more leisure would stimulate consuming activities and increase business. Labor organizations are also pressing for shorter work periods and higher wages. In general, Dr. Person sees signs of pressure for the prompt and complete conversion of the income resulting from greater efficiency into shorter work periods and more leisure.

What does this mean in terms of income and outgo? Viewing the problems from the standpoint of the people as a whole, it means that savings made by better methods and more intensive production are to be spent immediately in leisure. But there are other problems to face, such as unemployment, old age, illness and accidents. Are we to spend our earnings at once in immediate leisure or shall we save them to provide for emergencies, which may occur in the near future, and the assurance of a safe old age?

The proposition bristles with unknown quantities on every side, pro, con and neutral. There is no argument to which an objection cannot be given. The chances are that even the correct answer, if there is such a thing, is too far ahead of our time to be seriously undertaken now.

But the question is one which should appeal to serious-minded thinkers in economics.

Foreign Metal Control

Reports from the Department of Commerce, as given in the daily press, state that international cartels found it possible to consolidate their position during the year 1928. These cartels, or combinations to control trade, have assumed a commanding position in the metal trade of Europe.

Their main interest seems to have been the control of production. In the copper industry, for example, they absolutely dominate the international market, as shown by the price movements and the elimination of speculative trade. In aluminum a price reduction was forced, it is stated, due to the influence of American interests.

The effect of these cartels on American prices was not stated. Presumably American copper interests are able to take care of themselves as evidenced by the recent copper market, now 24 cents per pound. At the time of going to press a report has reached us of a break in London to 23 cents, but obviously that "break" will not worry American producers. Copper can crash to 16 cents without causing injury to any but speculative interests.

At one time there was considerable agitation for legislation to allow cartels or other working agreements in the United States, but this would have meant a revision of our anti-trust laws. Now, no such combinations seem to be necessary. The American metal market is in strong hands, broad-minded enough to realize that control must be tempered with caution. It is to be hoped that the copper situation will not get out of hand as this will make it even less likely that any protective measures can be taken at some future date when they may be necessary.

Repudiation of Contracts

Ask anyone if he would repudiate his contract. The answer would be instantly and indignantly "Never!" And yet we are confronted with the simple fact that the National Association of Waste Material Dealers, in a recent meeting in Chicago, was forced to adopt a resolution condemning the practice of certain unscrupulous dealers who under certain market conditions, deliberately violated their contracts. The trick takes the form of selling material already once sold, if by so doing a higher price can be obtained. It is stated also that this practice has been particularly noticeable in the scrap metal industry, in connection with the advancing market which the industry has experienced for some time.

The Association, in addition to condemning such practices, offers assistance by all legal means in the prosecution of such cases.

It is seldom that a question does not have two sides, but we have here such a case. This question has only one side. The only way to treat those who break their word is to refuse to do business with them except by signed contract. The only way to treat those who break their contracts is to prosecute.

Better still, however, it would be to refuse to do business at all with any whose word or contract is not trustworthy.

British Institute Comes of Age

In this issue is a report of the twenty-first annual meeting of the British Institute of Metals. When the Institute was founded in 1908, it had a membership of 250; the total is now over 2,000.

It is now generally recognized that the triumphs of modern engineering would have been impossible without the aid of metallurgy. Aeronautics, radio, television and even something so comparatively "old" as motor transport, would have been helpless without the new alloys developed for them. In this work of pushing outward the boundaries of metallurgy, the British Institute of Metals has taken a leading part.

We congratulate our British co-workers on their twenty-first birthday. We promise them a good race in the future to see which will do most for metallurgy, American or English efforts, but this is a minor consideration. We are all working with the same purpose, the increase of knowledge and the greater use of metals.

Platers' Research Meeting

The meeting of the Electroplaters' Research Committee and the Newark Branch of the American Electroplaters' Society was held in Newark on April 6th, just as this issue was going to press. Full reports will be published in our May issue.

Correspondence and Discussion

Lost Without The Metal Industry

To the Editor of THE METAL INDUSTRY:

Please renew my subscription to your valuable journal. I find many helpful kinks in it and I feel I would be lost without it.

Seattle, Washington. A. B. SHIPHERST.
February 10, 1929.

Good Results from Chromium Solution

To the Editor of THE METAL INDUSTRY:

I recently experimented with a 25 gallon chromium solution outlined by your plating editor, Mr. Proctor, and compared its results with those of a patented solution. Mr. Proctor's solution produced very much better results; it covered faster; the grain size was smaller; and the color was far superior. As a wear-resistance test I plated two low brass wires of ¼ inch diameter for 45 minutes, one in Mr. Proctor's solution and the other in the patented solution. Then I cut through the plate of each with a sand bobbing wheel (felt and pumice). The plate from the patented solution stood up 15 minutes and that from Mr. Proctor's solution held out for 35 minutes. I also experimented with a colloid in the solution, neutral ferrocyanide, 10 grams per gallon. I was able to use 25 per cent more current without burning.

East Providence, R. I., FRANK B. COLLINS.
March 15, 1929.

Cadmium Plating

To the Editor of THE METAL INDUSTRY:

I notice considerable mention of cadmium plating in your recent issues. I have done quite a great deal of cadmium work, with my own and with so-called patented solutions. Some of my experiences might be of interest to others.

I have noticed that a cadmium solution will often give good results with an 8 to 10 volt current in barrel plating. I have plated switches, bolts, screws, springs for carburetors, lock washers, etc., quite successfully this way. Often a cadmium solution will plate on the outside of the barrel, but it leaves a soft film which can be removed easily with a brush. By letting the solution become quite cold during the night I have found that this outside plating can be checked. Also, the addition of clear, cold water to the solution will help to check it. I have plated considerable work in wooden cylinders and the work at times has had to stand a salt spray test and be burnished after plating.

The cadmium anodes, in my opinion, should be mounted on steel 3 or 4 inches wide and about 3/16 inch thick up to the rod. I prefer either copper or brass riveted on the steel to curve around the rod, to make good connections. Of course, this brass or copper should not come in contact with the cadmium solution.

If a cadmium solution shows excessive free cyanide or is improperly balanced, it will cause a film to appear on the outside of the cylinder. The anodes should be bright. When they get black or crystallized I believe that there is a lack of free cyanide Sodium cyanide should then be added to clear the anodes. Also, excessive metallics in the solution, which comes from the anodes, will also tend to produce the film on the outside of the cylinder and crystallization.

Coldwater, Mich., ANDREW V. RE.
March 20, 1929.

Cadmium Plating

To the Editor of THE METAL INDUSTRY:

In the February issue of THE METAL INDUSTRY, page 91, there was published a formula for a cadmium plating solution. It has come to the writer's attention since that time that the formula for this solution is controlled by United States Patents No. 1,518,622 and No. 1,555,537, and Canadian Patent No. 284,269.

OLIVER J. SIZELOVE.

New Books

Born That Way. By Johnson O'Connor. Published by Williams and Wilkins. 323 pages; 5 by 8. Price, $6.00.

This book is a report of several years experimenting with selective tests practically applied in industry in various localities to various groups for various operations. The author covers a wide field, the scope being that of "human engineering." In other words, the determination of capabilities and the proper placement of individuals in the fields of endeavor best suited to their powers. According to F. P. Cox, the writer of an introduction to this book, "To one who has followed Mr. O'Connor's research, there does not appear to be any doubt that his accepted tests will reasonably predict the line of work in which the individual may expect to succeed."

Chapters in the book cover the following subjects. Human Engineering; Personality; Limitations in Adult Education; Early Training; The Future of Man; Genius; Formulating Knowledge; Opinion and Prejudice; the Dangers of Human Engineering.

Aptitude Testing. By Clark L. Hull. Published by the World Book Company, Yonkers, New York. 535 pages; price $2.68.

Professor Hull deals with the modern trend of intelligence testing, bringing to bear his knowledge and experience gained from years of research and teaching. He lays special emphasis on the testing of special aptitudes and the facts involved in all types of mental measurements. Dr. Terman has written an introduction to this book, praising it for directness, clearness of treatment and authoritativeness.

Special chapters of particular interest in employment work are: Analysis of Occupational Behavior; Assembling a Trial Battery of Tests; Administering the Preliminary Test Battery to a Trial Group of Subjects; The Determination of Actual Aptitude; Selecting the Final Aptitude Battery; Combining Tests to Secure Maximum Forecasting Efficiency.

Technical Papers

The International Temperature Scale, by George K. Burgess, Director of the Bureau of Standards, Washington, D. C. Research paper No. 22, Bureau of Standards.

The experience of the Bureau of Standards, as of the National Physical Laboratory and of the Reichsanstalt, has for many years past indicated the necessity, for industrial purposes, of international agreement on a scale of temperatures ranging from that of liquid oxygen to that of luminous incandescent bodies. As a result of discussion extending over a considerable period, agreement has been reached by the three laboratories, subject to possible minor drafting amendments on the attached specification for a practical scale, as affording a satisfactory basis on which uniformity in certification of temperature measurements for industrial purposes may be maintained.

Review of the Silver Market for 1928. Handy and Harman, New York. This is the annual review of the silver market which has been issued by this firm for many years and become recognized as one of the best authoritative summaries on silver. It is their judgment, after weighing various factors, barring unforeseen developments that the average price level of silver during 1929 will not be far distant from that of 1928.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS WILLIAM J. PETTIS, Rolling Mill; W. J. REARDON, Foundry; P. W. BLAIR, Mechanical; CHARLES H. PROCTOR, OLIVER J. SIZELOVE, Plating and Chemical

Brown Finish on Bronze

Q.—We are manufacturers of bronze memorial tablets and have been oxidizing the backgrounds with liver of sulphur. This gives us an almost black finish. Would like to know how to obtain a verdigris, also a rich brown finish.

A.—Either of the following formulae can be used to produce a rich brown color on your bronze memorial tablets:

Yellow barium sulphide	1 oz.
Water	1 gallon

Use at 140° F. Scratch brush dry.

Copper sulphate	4 ozs.
Potassium chlorate	1 oz.
Water	1 gallon

Use 180° F. Scratch brush dry.

Use the following formula to produce the verdigris finish:

Muriatic acid	1 quart
White arsenic	8 ozs.
Copper acetate	36 ozs.
Copper carbonate	8 ozs.
Ammonium chloride	36 ozs.
Hot water	3 quarts

Dissolve arsenic in the muriatic acid, and the other chemicals in the hot water. Mix the two solutions and paint on work. Relieve highlights with soft rag or tampico wheel. Wax to preserve finish.

—O. J. S., Problem 3,835.

Filtering Plating Solutions

Q.—We desire to employ agitation in our still plating tanks, but we feel that to do this successfully, we must have clear solutions and keep them clear. Filtration of plating solutions is the problem we are faced with, and, as we are not well informed on the subject, we are coming to you for help. We have the following tanks:

Six nickel solutions of 200 gallons.

Two brass, same capacity.

Two cyanide copper, same capacity.

What kind of filters should we buy and how shall we hook them up? This and any other information on the subject that you can give us will be gratefully appreciated.

A.—The simplest and least expensive method of filtration for your several solutions would be to connect an old-fashioned cast iron pump to each solution. Remove the handle and connect so it can be mechanicallly pumped. It would be advisable to have the pump arranged about 5 feet above the tanks, lead pipes to lead to the bottom of the nickel solutions from the bottom of the pump. Iron pipes will be preferable for the brass and copper solutions. Lead would be liable to contaminate them. To the pump spout connect filter bags shaped like a cone. These bags are usually about 18 inches long and 12 inches at the widest, tapering down to about 2 inches. Such filter-bags will hold all insoluble matter pumped from the solutions and can be easily cleansed by washing in water.

It would be possible to filter all six nickel solutions at one and the same time by using a small centrifugal pump so that all the solutions could be pumped into a reserve tank located about 8 or 10 feet above the tank.

The solution could be pumped and passed through the filter bag before entering the reserve tank. Six pipes of lead could be connected to a central pipe in the bottom of the tank and so each nickel solution could receive its proportional share. The methods outlined will give you an idea how to proceed. With the exception of the use of certain patented filters the data submitted will give the best results.

—C. H. P., Problem 3,836.

Improving Solutions

Q.—We are mailing you under separate cover samples of our three solutions: nickel, silver, and acid copper. Please tell us what these solutions need to build them for best results.

Our silver solution is used mostly for replating old silverware.

Our acid copper solution is made up of: 1¾ lb. copper sulphate, 4 oz. sulphuric acid, 1 oz. each yellow dextrine and aluminum sulphate.

The copper is very hard to buff; it streaks at times and comes out rough. Please tell us how our solution stands in regard to acidity and metal.

Our nickel solution is composed of: 8 oz. double nickel salts, 4 oz. single nickel salts, 2 oz. salamoniac.

We have added nothing to our solution except single nickel salts and nickel chloride since it was made up. Our work tarnishes very quickly. Is this caused by the lack of metal or is the acidity wrong?

A.—Analysis of nickel solution: Metallic nickel, 2.23 ozs., chloride, as ammonium chloride, .71 oz., pH. 5.2.

The solution is low in chloride and the pH is also too low. Would suggest that you make the following additions: 2 oz. boric acid and 1¼ oz. ammonium chloride to each gallon of solution; also add 6 fluid ozs. of 26° ammonium hydroxide to each 100 gallons of solution.

Analysis of silver solution: Metallic silver, 1.58 oz., free cyanide, 2.58 oz.

Add 1½ oz. silver cyanide and 2½ oz. sodium cyanide to each gallon of solution.

Analysis of acid copper solution: Metallic copper 6.78 oz., or 27 oz. copper sulphate; sulphuric acid, 1.46 fluid oz.

Solution is low in acid. Add 2½ fluid oz. of sulphuric acid to each gallon of solution. Do not use too high a current density.

—O. J. S., Problem 3,837.

Improving Strength of Alloy

Q.—We are making anchor heads for the U. S. Government. They weigh approximately 70 lbs. The specifications are: copper 88%, tin 8% and zinc 4%. These castings are supposed to have tensile strength of 35,000 lbs. per square inch, with elongation of 2 inch minimum.

We have experienced no difficulty in meeting the chemical test, but with the physical properties we have had our difficulties. We melt the brass in oil burning furnaces and the metal is clean and as a result we get good castings. How can we, while remaining close to the chemical composition, meet the physical requirements? Would the tensile strength be improved by using nickel? If this would increase it, how much should we use?

A.—We do not see any reason why you cannot meet the physical requirements of 35,000 lbs. per square inch. It may be possible you are not getting your test bar properly, or pouring too cold. We would suggest 2,100° Fahr. pouring temperature. If you are doing this now, we suggest you make a hardener of: 45 copper, 50 tin, and 5 of 30% manganese copper, and pour in ingots and use as follows: 83% copper, 10% hardener, 3% tin, 4% zinc.

Charge 83% copper. When melted and good and hot, skim and add the hardener, then the tin, then the zinc. Stir well and pour at from 2000 to 2100 degrees Fahrenheit, and you should have no trouble in getting 35,000 lbs. tensile strength.

If you are allowed to use nickel in your mixture, 1% to 2% nickel will improve the grain and increase the tensile strength. Use in the form of 50% copper and 50% nickel shot. This can be bought in this form, or you can make it up yourself and pour in water so as to shot it. It would be better for you to buy the 50% nickel copper alloy and use as follows: 84 copper, 4 copper nickel, 8 tin, 4 zinc. Either mixture given will help you.

—W. J. R., Problem 3,838.

Molds for Zinc Casting

Q.—Will you be kind enough to let me know what type of molds to use for casting zinc anodes? Should the mold be made of iron or alloy? At what temperature would you pour the zinc? To what temperature would you advise us to heat the zinc? What type of furnace would you recommend: gas, oil or electric? We intend to buy a half ton furnace. Would you pour any flux into the molds? We intend to use the anodes for electro-galvanizing strip steel. Could you recommend any particular design of furnace for the above purpose?

A.—The type of mold we would suggest for casting zinc anodes would be a bronze mold. Most of the molds made for zinc slush molding are made of bronze. Would suggest a pouring temperature of 450 to 500 Cent.

The type of furnace we would suggest would be an iron pot similar to babbitt melting pot; fuel, gas preferred; oil can be used if desired. Any of the foundry supply houses will supply designs of babbitt melting furnaces to be used for zinc melting.

—W. J. R., Problem 3,839.

Removing Metal Stains from Granite

Q.—What will remove the dark metal stains from granite which are caused by the weather running down over a bronze tablet and making black streaks on the granite?

If you have published anything previous on this question, kindly refer to what volume it can be found, as we have your bound volumes since 1907.

A.—We suggest that you try oxalic or muriatic acid and water; 1 part of either acid and 16 parts water. If found necessary, the acid may be increased and water decreased.

The stains are metallic oxides and are soluble in dilute acids. Apply the acids with a sponge and let them soak in; when the stains are removed, wash the granite, first with water and then with dilute ammonia water; 1 part ammonia, 26°, to 32 parts water.

The ammonia water will neutralize the acid. Finally, wash well with clean water. If the granite has to be scoured afterwards, use hydrated lime or whiting and a little water with a bristle brush.

—C. H. P., Problem 3,840.

Spots on Copper Plate

Q.—I am sending you under separate cover an escutcheon plate in oxidized copper plate, which is something new to us in the line of defects on wrought metal. Can you tell us the cause of this spotting and what we can do to prevent it?

A.—Yours is the regular spotting out problem. The oxidizing solution became absorbed in the copper deposit and during the humid weather, spotted out, even though lacquered. This is a common occurrence in the humid weather of Summer. We would advise you to read the reprint we are sending you.

Thorough washing of the articles in cold and boiling waters is the secret of overcoming spotting out. To the boiling water add ⅛ oz. phosphoric acid per gallon.

—C. H. P., Problem 3,841.

Scrap Battery Plates

Q.—Some time ago I noticed in your magazine a method for the recovery of lead from old battery plates. Unfortunately I am unable to locate it now and would appreciate it greatly if you will answer the following questions:

What is the approximate average percentage of lead in old battery plates? In what forms is the lead present and the percentage of each?

What is the best charge for a small blast furnace?

What is the percentage of antimony in the work lead produced?

A.—The approximate percentage of lead in old battery plates is about 85% lead and antimony (approximately 5% antimony). The lead is in the form of sulphite and litharge or oxide of lead.

A charge of 600 pounds for a small blast furnace.

The antimony in battery lead amounts to approximately 5%.

One of the essential requirements of smelting battery lead is the flux used. It should contain approximately 30% to 35% silica, 25% to 30% iron, 18% to 20% alkaline earth, 4% to 8% alumina, and 1% to 5% sulphur.

It can be made up with approximately 15 parts soda ash, 75 parts silica sand, 50 parts fluorspar, 200 parts coal dust, 50 parts barren lime and 200 parts iron scale. Use 20% of flux in smelting. However, this mixture of flux may not analyze as it should. It can be changed so your slag runs freely and after a few heats the slag can be used over, at least, a large percentage of it. The exact percentage of lead in battery cells is 207 grams per cell in the form of sulphate.

—W. J. R., Problem 3,842.

Spotting on Silver

Q.—We are having quite a bit of trouble with some of the silverware which we plate, as we find that two or three days after it has been polished it spots out. Would you kindly give us the reason for this?

A.—It is impossible to answer your question satisfactorily from the information given. Send sample of solution for analysis, also a small piece of work that has the spots that you mention and we will advise you further.

These spots may be due to the base metal or they may be caused by the condition of the solution.

—O. J. S., Problem 3,843.

Standard Deposits

Q.—We are looking for some information that will give us the average amount of brass, bronze and copper plate required for hardware. If you can give us any help in this matter, or if you can suggest any literature that will be of assistance, we shall be greatly obliged.

A.—There are no specified standards as to the amount of brass, copper or bronze that should be deposited upon builders' hardware or other similar products.

Eventually a standard specification must be evolved. The Bureau of Standards, Washington, D. C., has done some work along these lines under the supervision of Dr. William Blum. We suggest that you write to Dr. Burgess, Director of the Bureau, for advice in the matter.

We ourselves are unable to give you any information. The hardware manufacturers must get together and decide upon standard deposits for their products, or it must be developed for them. Many hardware products are absolutely worthless. They rust in a day or two when exposed to the weather.

—C. H. P., Problem 3,844.

Using Tobin Bronze Scrap

Q.—We have several tons of tobin bronze rod ends on hand which it would be very advantageous for us to use in our brass foundry in the production of castings for steam and centrifugal pumps. We have attempted to use castings made from this metal alone but we have found the castings, although nearly perfect, to be so soft as to be absolutely impractical for pump liners, valve seats, or anything where any wear takes place. Would it be possible to alloy this metal in such a way as to make suitable castings for our use?

A.—We would suggest that you make an analysis of your Tobin bronze which should run approximately 59 to 63 copper; ½ to 1½ tin; 39 to 40 zinc. Some mixtures contain 1 to 2% of iron.

However, make an analysis of your scrap. Do not take any notice of the iron or tin and add copper or zinc so that your mixture will contain: 58½ copper; 41 zinc; ½ aluminum. Or take the scrap as you have it and add ½% aluminum and you will come very near the mixture given and will have an alloy that will be similar to manganese bronze. Make castings in your usual manner, and this mixture will stand over 60,000 pounds per square inch.

A method of testing this alloy, which is quite useful, is to dip out of the crucible before taking from the furnace, a small amount of the metal and pour in a strip 12 in. long, ½ in. x ½ in., and bend. If the metal is tough and hard to break and there is a fine fracture, it is satisfactory. If brittle and coarse-grained, known as canary color, add more copper, stir, and test until test bar is satisfactory. This should enable you to use your material advantageously, as it will be similar to manganese bronze in quality,

—W. J. R., Problem 3,845.

Patents

A Review of Current Patents of Interest

1,702,765. February 19, 1929. **Metallic Alloy and Process of Forming the Same.** Henry L. Coles and Joseph G. Donaldson, Hamilton, Ohio, assignors to Guardian Metals Company, Hamilton, Ohio.

An alloy comprising not more than 86% of tungsten, approximately 14% nickel, and 2 to 5 per cent carbon.

1,702,766. February 19, 1929. **Composite Metal Plate.** Henry L. Coles and Joseph G. Donaldson, Hamilton, Ohio, assignors to Guardian Metals Company, Hamilton, Ohio.

A metallic plate comprising an alloy having incorporated therein upwards of 70% tungsten, substantially 10% nickel, and substantially 14% copper; and a metal of high heat conductivity substantially encompassing said alloy and being united thereto as by alloying therewith.

1,702,927. February 19, 1929. **Bearing Material and Method of Making Same.** Fred K. Bezzenberger, East Cleveland, Ohio, assignor to The Cleveland Graphite Bronze Company, Cleveland, Ohio.

In a method of making a self-lubricating material, the steps which consist in passing a current through a solution of a salt of a bearing metal containing a small amount of finely divided lubricant and thereby depositing such metal and lubricant upon the cathode in a uniformly distributed condition.

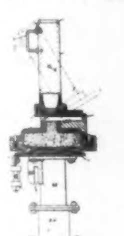
1,703,212. February 26, 1929. **Antifriction Metal.** Robert Jay Shoemaker, Chicago, Ill., assignor to S. & T. Metal Company, Chicago, Ill.

Alloy consisting principally of lead and containing the following metals in quantities by weight substantially as follows: tin 1.0% to 5.0%; calcium 0.1% to 1.0%; magnesium 0.02% to 0.3%, and aluminum 0.02% to 0.1%.

1,703,329. February 26, 1929. **Process for Separating Copper from Nickel.** Israel W. Wilenchik, Philadelphia, Pa.

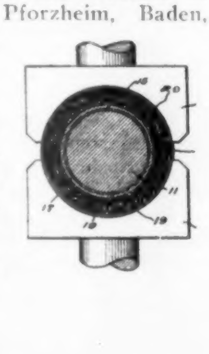
A process for separating copper from nickel in their alloys, which consists in subjecting the alloy together with an intimate mixture of sulphur, sodium sulphate, calcium sulphate and coke to the action of heat until molten, then pouring the molten mass into a settler, whereby upon cooling the sulphides of copper and nickel separate by gravity, and subjecting the sulphides after mechanical separation to separate treatment for conversion into oxides and subsequently into metals.

1,703,708. February 26, 1929. **Core-making Machine.** De Forest W. Candler, Detroit, Mich., assignor to Earl Holley, Detroit, Mich.



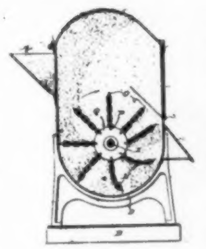
In a core blowing device, comprising a movable table, a core box located thereon, a substantially vertical cylinder adapted to contain one charge of sand, and to engage with said core box, means for supporting said cylinder so that it is free to move in a vertical direction, means for admitting compressed air to the upper part of said cylinder, whereby on the admission of compressed air the substantially entire contents thereof is discharged into said core box, means for oscillating said cylinder on a horizontal axis to facilitate the refilling of said cylinder between each operation.

1,703,940. March 5, 1929. **Plated Wire and Process of Manufacturing Same.** Emil Kollmar, Pforzheim, Baden, Germany, assignor to General Plate Company, Attleboro, Mass., a Corporation of Rhode Island.



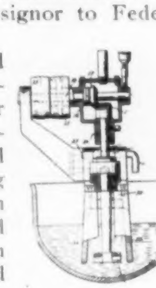
The process of manufacturing plated wire which consists in covering a cylindrical base core to completely envelop the curvilinear surface of the same with previous plating metal in thin sheet form, the latter having overlapping edges, compressing the sheet plating metal uniformly about and against the surface of the core by applying to the core a tightly fitting metallic jacket, squeezing the jacket about the covered core, encasing the jacket with a yieldable, heat-insulating material, heating the jacketed and covered core to a temperature less than the melting temperature of the plating metal, subjecting the jacketed and covered core while heated to a welding pressure, removing the heat-insulating casing and the jacket, and subjecting the cylindrical plated core to an attenuating process to form plated wire.

1,703,956. March 5, 1929. **Means for Preparing Molding Sand.** George F. Royer, Wilkes-Barre, Pa.



An apparatus for the purpose described comprising a casing closed at the top and provided with an imperforate curved bottom and side walls, and closely adjacent means rotatable about a substantially horizontal axis within the casing for agitating material deposited on the bottom, the top of the casing being spaced from the bottom a distance greater than the vertical diameter of the path of movement of said means to provide a chamber in which particles of material carried upward by the rotation of said means may commingle.

1,703,966. March 5, 1929. **Agitator for Molten Babbitt and the Like.** Salem Smith, Detroit, Mich., assignor to Federal Mogul Corporation, Detroit, Mich.

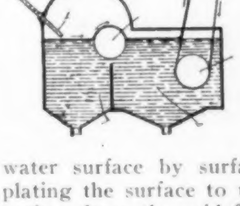


Means for agitating molten babbitt and the like, having, in combination with a supporting frame adapted to be positioned over the open top of a container, a pivotally connected bracket supported therefrom, said bracket having its end formed as a bearing of vertical axiality when the bracket is in lowered position, a shaft rotatably supported intermediate its ends by said bearing portion of said bracket, an agitating blade carried on the lower end of the shaft, and means carried on the upper end of the shaft whereby it may have rotative actuation transmitted to it from an external power source.

1,704,086. March 5, 1929. **Method of Cleaning/or Annealing Metal.** Noak Victor Hybinette, New York.

The cleaning of metallic nickel alloys, metals containing chromium and the like from a relatively insoluble coating of oxide, which comprises subjecting the same to the action of a molten slag capable of dissolving such oxide, such slag containing boric acid together with other ingredients which give a slag which is elastic while hot but brittle when cold.

1,704,125. March 5, 1929. **Metal Plating Non-Metallic Substance.** Harry C. Fisher, Cincinnati, Ohio, assignor to The Richardson Company, Lockland, Ohio.



A process of metal coating a non-metallic product which consists in applying a bituminous surface thereto, rendering said surface tacky by means of a solvent, and bringing the product into contact with film of finely divided metal supported on water surface by surface tension, and subsequently electroplating the surface to unite the metal picked up by the tacky surface from the said film.

1,704,208. March 5, 1929. **Alloy and Method of Making Same.** John V. O. Palm, Cleveland Heights, Ohio, assignor to The Cleveland Graphite Bronze Company, Cleveland, Ohio.

An alloy of approximately the composition: lead 82%, tin 9%, antimony 4%, zinc 3%, copper 1½%, and aluminum ½%, by weight.

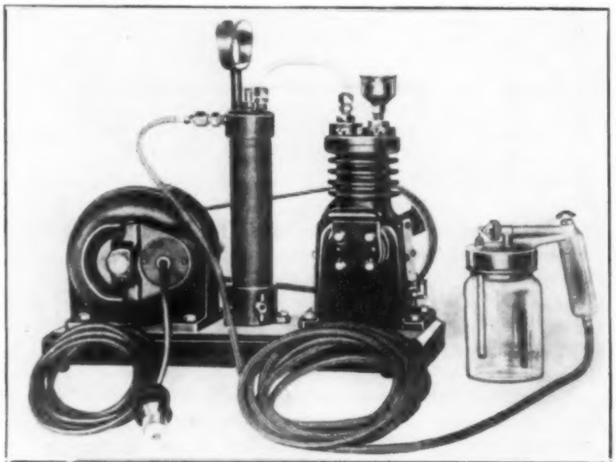
Equipment

New and Useful Devices, Machinery and Supplies of Interest

Small Spray Painting Outfit

Never before has there been such a universal interest and activity in the production of painted and decorated products as there is today. The fact that new materials and new equipment for easy application of modern paints, enamels, and lacquers enable any merchant or manufacturer to economically and successfully enhance the appearance of his products probably has much to do with the present popular interest in such work and the fast-increasing use of color in finishing or manufactured products.

Many shopkeepers and makers of devices and products have



New Type Small Paint Spray Outfit

found that the use of color in finishing operations stimulates sales, and the popularity and easy use of color have turned many a business into a more profitable operation for the owner. So universal has become the demand from all trade and industrial classes for a dependable spray painting and finishing outfit of easy portability, low price and absolute dependability that The DeVilbiss Company of Toledo, Ohio, an organization specializing in spray-painting equipment, has given special attention to the needs of the almost infinite variety and number of such users today, that company states in announcing the new DeVilbiss spray painting and finishing outfit type NC-601. In the creation of this remarkable little outfit, it is stated, DeVilbiss has stressed durability, capacity, and serviceability, recognizing the fact that it must measure up to the serious requirements of practical men engaged in important painting and finishing operations.

The outfit is complete with air compressor, ready for use. The operator puts the material into the paint container, plugs the electrical connection into a light socket and goes to work. It delivers a finely atomized spray adjustable from a round spray to a fan spray 3½ inches in width. This outfit weighs only 47½ pounds, and can be carried from place to place. The air supply is ample, and the pressure is always constant, the makers state. It is said to conform to the character, quality, and efficiency of the larger DeVilbiss outfits, which are in use today in large painting and finishing operations.

Some idea of the wide scope of utility of this outfit can be gathered from the fact that it is sold to factories, garages, stores of all kinds, apartment houses, hotels, hospitals, institutions, public buildings, auto service shops, theatres, art studios, churches, public halls, service departments of manufacturers, painters and decorators, plumbers, furniture dealers, shops of all kinds and to home owners.

Induction Furnace Is Filmed

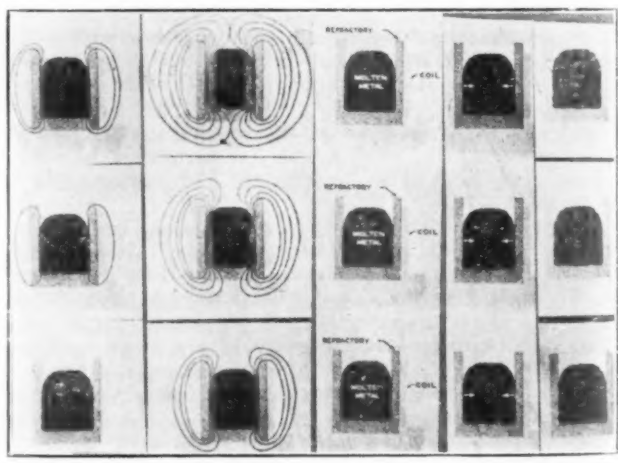
The operation of the Ajax-Northrup high frequency induction furnace is entirely different from that of arc furnaces or other types of electric furnaces. In order to get the story of this furnace before the public, the Ajax Electrothermic Corporation has prepared a film showing actual furnaces in operation and showing the way in which electrical energy acts on the charge in the furnace.

Those familiar with the use of these furnaces will be interested in the novel way of showing Faraday's "Lines of force," by means of ink lines on a cross sectional view of the furnace. Figure 1 shows the way these lines are represented; and when the film is projected, a good idea is obtained of the way in which the lines actually build up and collapse. Figure 2 shows the names of the essential parts of the furnaces. Figure 3 shows arrows indicating resultant pressure caused by repulsion of charge from coil.

Figure 4 shows the method by which flow lines in the molten metal are indicated. The position of the short lines changes as the film progresses indicating four swirls of the molten metal in the furnace.

An effort has been made to minimize the advertising factor. Furnaces are shown in actual operation in the plant of the Ajax Electrothermic Corporation, Trenton, N. J., and in the Edgar Allen Steel Company, Sheffield, Eng.

The old method of melting in crucibles is shown so as to make vivid the comparison between this primitive, hot and disagreeable



1, a 1, b 2 3 4

Figs. 1, a and b—Lines of force on cross-section of furnace. Fig 2—Cross-section of furnace. Fig. 3—Section of furnace with molten charge, showing resultant pressure causing stirring. Fig. 4—Succession of lines, showing stirring motion.

method with the new, clean and efficient method made possible by the invention of the coreless induction furnace.

The 150 kw., 600 lb. furnaces at the Heppenstall Forge and Knife Company are shown with a separate picture of the electrical equipment.

Two 1,000 lb. furnaces at Babcock and Wilcox Tube Company are also shown.

The application of the coreless induction furnace to the heating of metals for forging is shown, and it is quite striking to see white hot steel coming from a cold furnace. The method of putting linings in 500 lb. melting furnaces is illustrated by flashes of the essential parts of the operation.

Super-Refractories—A Boon to the Brass Foundry

By FURMAN SOUTH, Jr.
President, Lava Crucible Company, Pittsburgh, Pa.

Great advances have been made in recent years in the development of refractory materials for non-ferrous melting furnaces, and in the design of the shapes used. The outstanding achievements have been in refractories for the crucible furnace. Prior to the advent of gas and oil crucible furnaces, melting was done in coal or coke fired pit furnaces. The refractory problem was not serious, because the only refractory needed was for the cylindrical lining wall. With natural draft there was no terrific cutting action, and the ordinary fire brick refractory, made in the form of circle brick, served admirably. The introduction of the gas and oil furnaces, stationary and tilting type, brought new problems which have increased steadily with the demand for faster melting and the higher temperatures required by a multitude of new metal mixtures that have been developed.

At the beginning, the ordinary fire brick refractories were the only ones available for these furnaces. But these have failed to keep up with the demands put upon them. There are three separate refractory problems, exclusive of the crucible, in a crucible furnace: (1) the furnace cover; (2) base block; and (3) lining. Two of these are peculiar to the gas and oil furnace, namely the furnace cover and the base or rest block.

The furnace cover offers a number of problems. It must be made, preferably in a single piece, to diameters up to 38 inches, and weights exceeding 300 pounds to the piece. It is subjected to repeated heating and cooling, with the resultant expansion and contraction. It is seldom rigidly supported by its metal band, and is subject to torsional strains which tend, through twisting action, to crack it. It must resist the highest temperatures existing in the furnace, and through its exhaust hole must withstand the action of high temperature gases at high velocity, which have a terrific fusing and erosive action.

The ordinary fire brick cover fails to meet these demands. It is not strong physically and will crack through torsional action of the band. It will spall under repeated heating and cooling. And its center hole will be eroded rapidly, increasing the size of the exhaust hole from which the waste gases escape, with resultant increase in fuel consumption and slowing up of melting time, with its direct effect on the production of the furnace. Its life is only a matter of a few weeks, and during a large part of this time it is performing inefficiently.

The development of the super-refractory cover has eliminated this undesirable and costly condition. The silicon-carbide type has been the most serviceable one yet developed. It has great physical strength and when supported properly will not crack at all. It does not spall or sand away. It has extremely high temperature resistance which is particularly effective at the exhaust hole. It is made either in a single piece, or with replaceable center inserts, which guarantee the exact maintenance of the exhaust hole throughout its life. It gives months of service and in many instances, service of more than a year is reported.

The base or rest block is of more importance than the average foundryman credits it with. A crucible should be exactly centered in the furnace. Otherwise combustion efficiency is impaired, and the life of the crucible is reduced by the effect of different temperature on opposite sides of the crucible. The crucible should also be maintained at a given position in the furnace as regards burner position and clearance under the cover, for proper performance. A block that will not soften and squat is necessary for this.

The base block should be a conductor of heat to insure using all of the surfaces of the crucible for heat transfer, resulting in greater combustion efficiency and increased crucible life.

These requirements are met by the super-refractory base block of the carbon type. It has the physical strength to carry the weight of the crucible with its charge of metal, the temperature resistance to prevent softening, and being of the carbon type, is a high conductor of heat.

The furnace lining itself is the most important of the three items. As mentioned above, the original developments were with the fire brick refractory in the form of circle brick. These have always been a source of frequent renewal, laborious repair, inefficient operation and high maintenance cost to the foundryman. Later the use of plastics for rammed-in monolithic linings was the vogue. These were a considerable improvement but offered the great disadvantage of laboriousness of installation, and length of time necessary for relining. And unless properly installed, gave less than normal life.

Both of the above types require constant maintenance and the expense incidental thereto.

A recent development has been perfected that has eliminated the problems and expense that have had to be contended with. This development is the ring type of crucible furnace lining. The lining is made up of four or five annular rings. The burner and slag holes, and any other openings required, are built into the lining in exact position and of proper size and contour, by the manufacturer.

To install the lining it is only necessary to drop the individual rings, which are easy to handle, into their position in the furnace, in the order laid out and marked by the manufacturer. A thin layer of joint cement is spread on each ring. The lining can be put into operation immediately, and the average time for the complete installation, from the start, until the heat is turned on, is about **one hour.**

The linings are made of super-refractory materials. When the carbon type is used, clearance is allowed between the lining and the furnace shell for filling with insulating material in powdered form. This clearance is made possible by the fact that the wall thickness of these super-refractory rings can be reduced.

This type of lining serves for months before maintenance is necessary. The rate of erosion or burning out is very slow, and the proper combustion areas of the furnace are maintained for the maximum length of time.

When a furnace is newly equipped with refractories, it is ready to operate at its greatest efficiency. The diameter and walls of the lining are correct. The exhaust hole in the cover is exact to design and the crucible is properly positioned and supported by the base block.

With wear, the combustion areas of a lining are enlarged, increasing the amount of fuel necessary to maintain a given temperature. With wear, the exhaust hole in a cover is enlarged, allowing more rapid escape of the exhaust gases, and tending to lower the temperature of the furnace. The burning of bellies in the lining throws the combustion out of balance and creates zones of varying temperatures around the furnace, shortening the life of the crucible. For it is a proven fact that crucibles give better service in well conditioned linings than in worn ones.

In short, worn linings increase fuel consumption, decrease crucible life, and decrease the melting rate of the furnace, which means less production and at greater cost.

Let us assume that one type of lining costs twice as much as another and gives twice the service of the other. It could readily be thought that there would be nothing to choose between the two, outside of the first type having the advantage of a labor saving in its one installation. But it may be overlooked that the first type, because of its ability to give long service, will maintain its efficient areas for a greater length of time than the total of the other two, with a longer period of efficient fuel consumption, efficient production rate, and high crucible life.

Such savings do not reflect themselves in cost records to the direct credit of the item responsible for them. But they are there, in the final cost, having their effect on the profit margin.

New Brinell Microscope

The ever increasing use of the Brinell hardness test in industry has made it necessary to perfect the existing lens and measuring miscroscope devices, which are essentially adapted to laboratory use; or even to replace them by another instrument, which would afford in the hands of both employer and operator absolutely trustworthy neasurements of at least the same degree of accuracy,

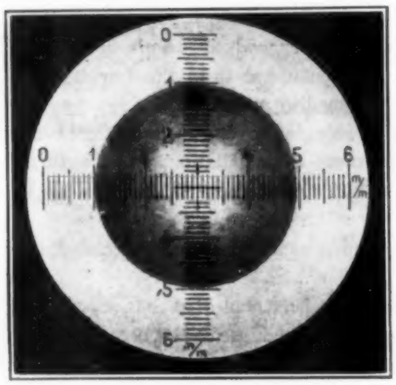


Fig. 1—Photograph Showing Means of Measuring with New Brinell Hardness Testing Microscope

says a bulletin recently issued by the Paul F. Hermann Company, Keenan Building, Pittsburgh, Pa., who have been appointed sole sales agents for the Busch-Schumann projector-type microscope for Brinell hardness testing machines. This company states that the lens and measuring microscope can be entrusted only to those skilled in taking the measurements, and that with these instruments the work needs especially good illumination which cannot always be easily had due to the position, shape or form of the object being tested. It is claimed that they have the further disadvantage of tiring the operator's eyes owing to the necessity of double focussing on scale and object.

With the Busch-Schumann device, they claim, the image of the Brinell ball impression, even when a lipped rim is produced, appears at once, magnified ten times and sharply focussed on a ground-glass screen as soon as the instrument is set up in the spot to be measured; so that the meaurement can be read immediately and without trouble, with both eyes and with great accuracy; moveover the result, unlike that obtained with lens and measuring microscope appears with even edges and without any focussing.

With the light falling always perpendicular to the measured surface, the edge of the crater, unlike that produced with lens and microscope, is always revealed with equal sharpness of definition, even when the rim bulges, as the photograph of the ground-glass plate (Fig. 1) shows.

In consequence of the small size of the instrument, the measurement and testing of materials is now possible in places which are difficult to reach, where formerly reading with lens and measur-

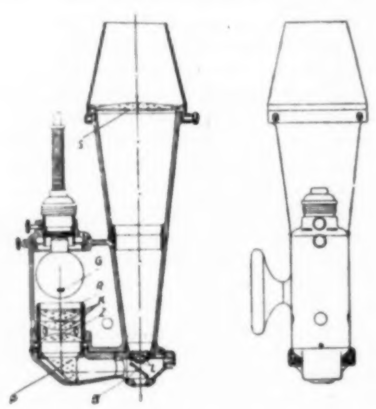


Fig. 2—Diagram Showing How the Device Is Manipulated

ing microscope were either difficult or had to be abandoned on account of the poor lighting. This type of measuring instrument altogether new, fulfills thoroughly all expectations and requirements, as has been proved by experience in numerous factories. Its manipulation is stated to be simple, as shown in Fig. 2. It is about 12" long. The projector with its interchangeable lower part is set upon the surface to be measured. The illuminator in the instrument lights up the surface intensely. The image is projected through the built-in objective onto the ground-glass screen arranged above it, on which then two diameters of the Brinell impression can be read with an accuracy of 1/320 in., or greater with the help of the cross-scales on the ground-glass. The ground-glass with scale can also be rotated, so that now both diameters can be read quickly for any desired setting.

With a special device Brinell-ball-impressions may also be obtained of recessed surfaces or surfaces which are not plane. Also carrying a vertical ground-glass slide. This enables one without further adaptation to take satisfactory Brinell tests on the inner walls of hollow cylinders, with a minimum internal diameter of 8¾ in., or to make measurements in which readings on a vertical ground-glass slide are desired. In special cases the ground-glass images may be recorded photographically by the insertion of a photographic plate (size 3½" x 2½"); the necessary accessories for this purpose are supplied separately.

The projector, furthermore, can be used for forgery examination of paper money and signatures. Also for the examination of paper and fabric products (counting of threads), and is suitable for use in the watch industry, for medical purposes, etc.

New Chase Brass Mill

The first unit of the mid-western plant of The Chase Brass and Copper Company of Waterbury, Conn., which is to represent an ultimate investment of more than $6,000,000 within a few years, is under construction in Euclid, Ohio, a suburb of Cleveland. The Austin Company, designers and builders of the plant, expect to have it ready for production by the middle of the summer.

The new structure, a rod and sheet mill, is located on a tract of 60 acres between the New York Central and the Nickel Plate Railroads. Option has been obtained on 40 additional acres.

The unit now under construction can be expanded in three directions. The main building is 225 by 1,000 feet. Three aisles run longitudinally through the main building, each approximately 75 feet wide. In each aisle is a 10-ton traveling crane with a 70-foot clear span.

The walls will be of brick and steel sash construction, and cement tile slab is being used on the roof. Steel columns are spaced 75 feet apart transversely and 40 feet longitudinally.

The plant is of one-story construction, except for a basement under the casting department. A tunnel under the entire length of the building contains all service pipe lines. The roof construction is of sawtooth design, each tooth being a 40-foot span.

Three thousand tons of structural steel will be used; 100,000 square feet of sash and glass; two miles of sash operators; 2,500 squares of roofing and 10,000 yards of concrete.

A complete power plant will be located in a separate building. Because of the large quantities of water required in production, the company will run its own water line from Lake Erie, two miles distant. Plumbing, heating, lighting and power wiring will be installed by The Austin Company.

In addition to main line tracks on the North side of the plant, railroad facilities will include a siding which is to enter the plant at the East and West ends.

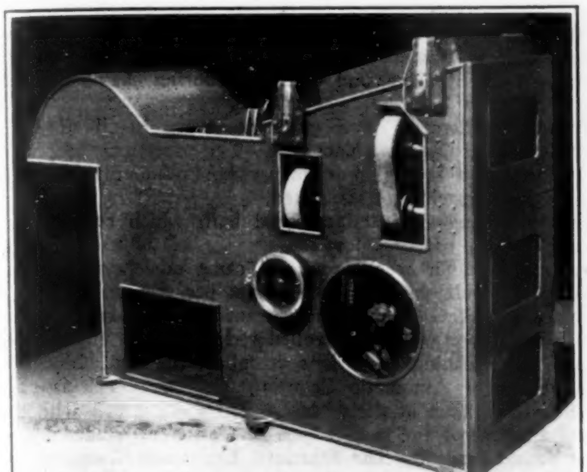
Aluminum Shop Crane Ordered

The Alliance Machine Company, Alliance, Ohio, has received an order from the Aluminum Company of America for a ten-ton traveling shop crane, the main girders of which will be constructed from strong aluminum alloy. This use of aluminum will materially reduce the wheel load on the building and, it is expected, will also reduce operating costs.

Upon completion the aluminum crane will be installed in the new structural shape mill at the Aluminum Company's Massena works. At the same time it is planned to install a duplicate of this crane built of steel in the blooming mill at Massena so that direct comparisons of operating expenses can be made.

Screw Machine Chip Separator

A machine for separating products of the screw machine from the chips that are formed in screw machine operations has been developed and placed on the market by the McKenzie Engineering Company, 352 Hope Street, Glenbrook, Conn., makers of special machines, instruments, etc. The illustration herewith shows the chip separator. It is claimed that this machine will separate out a bushel of ordinary screw machine products in one minute. It will operate on parts ranging from 1/8 in. to 2 1/2 in. in diameter and up to 4 1/2 in. long. It will handle all kinds of screws, bolts,



Machine for Separating Work from Chips

nuts, wood screws, cartridge shells, etc. The latest model is said to be heavier, lower and with more solid frames than the older types, and has blast gate combined with blower. The vibrator and self feeder are hung on swing brackets and driven with crank shafts. The machines are equipped either with motors or with countershafts, according to user's needs.

The machine is used after oil has been extracted from the mass of chips and products taken from the screw machine. The whole mass is thrown into the separator, an air blast is adjusted to blow according to size of product, and this feeds the material into a vibrator, where separation occurs, after which the products are removed. The makers claim one separator will take care of the output of 400 to 500 automatic screw machines.

Air Conditioning Aids Battery Output

The problem of quantity output of electric batteries to meet a demand, which, for volume and variety, is without precedent in automotive circles has been solved by air conditioning engineers who have introduced "mass production" methods to battery manufacture, according to The Modern Science Institute, Inc., Toledo, Ohio. Production lines, similar to those in the plants of the quantity producers of automobiles, are a feature in several of the shops of the big battery makers. Thousands of batteries move forward daily on belt conveyors while men stand like a gauntlet down the line to affix parts and perform operations which finish the product that gives electrical energy for starting and lighting millions of automobiles.

Scientific application of the latest engineering developments to cut costs, improve product, speed up output and protect the health and lives of workmen, has been adopted in one big eastern plant. It is in this plant where fumes from melted lead, gases and poisonous dusts used in large quantities are recovered by control of air conditioning through a system of powerful ventilating fans which segregate these hazards without danger to workers.

In the group burning room of this plant, where the battery plates are formed into groups, lead lugs of considerable weight are blown through pipes by an air pressure which approximates three miles a minute. These lugs, which are the ragged edges cut off the plates, are re-melted to become the material in other plates. Fine lead dust and other materials are handled in this way, although the company uses an air washer to recover lead dust from the air which is blown through a spray of water. The air washer recovers approximately 75 pounds of lead per week by removing the dust, according to the plant engineer of the company.

In the foundry, hoods are used over the lead pots to collect the lead oxide fumes which come from the melted lead. Suction fans draw the fumes up through large pipes to remove the danger from workmen. One of the most unusual applications of mechanically controlled air in this plant is for the purpose of blowing acids from the storage rooms near the railroad tracks through pipes a distance of 500 feet into the developing room where the acids are poured into the battery which, acting on the plates, produce electrical current.

In the box room of the plant, where wooden separating plates and other wooden products are made, scrap lumber, sawdust and shavings are blown by air suction to another part of the plant and used as fuel.

In cooperation with air conditioning experts, this company has developed a dustless system of blending lead oxides to manufacture battery paste. In former years this was considered impossible. The work is arranged in such a manner that all the various operations are synchronized into a co-ordinating closed system. The result is that lead oxide is being handled at a rate of 5 to 6 tons per hour.

Soldering Porcelain

Of all insulating material, porcelain is perhaps the most important used on the outside of machinery; but the smooth, hard glaze which is so useful in insulation has made a tight, strong, mechanical joint very difficult. Cement is the main standby, but cement is not as strong as porcelain because it takes up water and is neither good insulator nor good conductor.

Metals can now be soldered to porcelain, according to the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The process is said to give a joint that is stronger than porcelain, and so tight against air and liquid pressure that it will hold a high vacuum. Being metallic, the joint will not take up water, and being a good conductor, it equalizes insulating stresses on the porcelain near it, thus often increasing its actual insulating value.

Recent tests of the subway transformer bushing showed notable results.

In torsion and in shear, the porcelain tore in two with the soldered joint still holding; in shear at about 3,000 lb. per sq. in. A similar result was found with a cantilever stress of 3,180

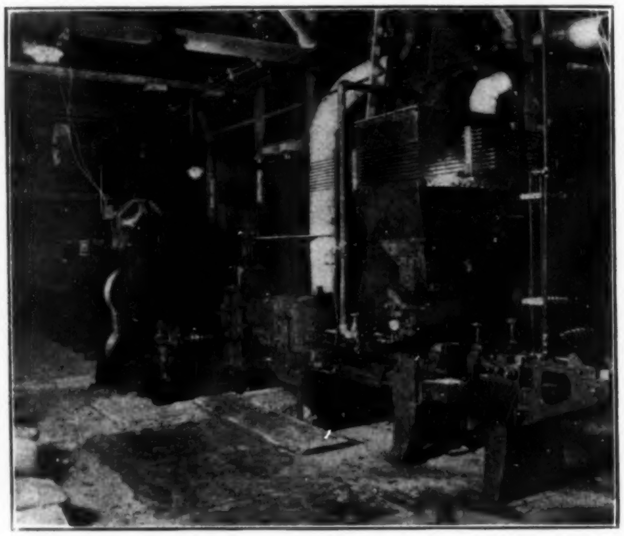
An Oil-Tight Bushing, Metal Soldered to Porcelain. Arrows Show the Points Soldered

in.-lbs., the porcelain failing at the edge of the solder. After 5 minutes of air pressure at 80 lb. per sq. in., the joint was vacuum tight. The "standard ice-box test" of zero to 65° C. cyclic changes left it unhurt. A 10,000 ampere short circuit on the stud (normal rating 1,200 amp.) after a minute or two melted the solder from the stud, but not from the porcelain.

The new soldered seal is recommended for use in mercury rectifiers, and in all sorts of cable and subway fittings, potheads, bushings and the like, especially in view of the use of oil-filled cable. Successful application, though simple, requires skillful and experienced technique, and operators must be carefully trained.

Removing Scale from Metals

A new process and specially designed machinery for removing scale from steel and non-ferrous metals has been designed after some years of research by C. A. Dreisbach and associates, of The Standard Equipment Company, Inc., New Haven, Conn. A complete equipment for scale removal from hot rolled strip steel has just been placed in operation at the Athenia-Clifton, N. J., plant of the Athenia Steel Company, 135 William Street, New York City, where it may be seen in operation, according to the makers. In regard to this apparatus, it is stated by the makers that Mr. Dreisbach designed and invented the sand blast machine known as the New Haven Model A Barrel and Hose Type. This type of barrel is now made by the company he is associated with and is used by several hundred foundries and manufacturing companies



Machinery for Removing Scale from Metals

for cleaning and removing scale from castings, forgings, heat treated springs and other articles and also for frost finishing castings, stampings, etc.

During many years of practical experience in sandblast cleaning and finishing various kinds of materials, he made numerous tests with many kinds of abrasives blasting with compressed air at low and high pressures, but could not produce a satisfactory finish for cold rolled steel strip, rod, and wire. The impact of the abrasive material would remove the scale and also pit the stock. Makings tests, he learned by microscopic inspection that the depth and size of the pits in the stock varied in relation to the angle of impact.

Having complete records on tests covering the best kinds of abrasive, angle of impact, and operating pressure for removing scale, he then made an experimental machine in order to check up. This experimental machine which was then used for making further tests in cleaning hot rolled and annealed flat stock (steel) up to 1 in. wide and No. 5 rod and wire. This machine removed all scale and produced a smooth finish. One pass or draw on the cleaned stock produced a bright surface free from pits. This proved the practical application of these principles to a production machine, the company states.

Further experiments were necessary to determine efficient sizes, designs and combinations of air nozzles, scouring chambers, etc., during which was produced a combination that increased the linear cleaning feet to maximum output at the lowest consumption of compressed air, abrasive, and wear on scouring chamber, nozzles, etc.

Careful consideration was given to every detail of design, materials, and replacement part cost. The parts may be removed and replaced in a few minutes time without removing the strands of stock from machine, it is stated.

A machine was then designed and built which removed scale and oxide from copper alloy rod at rate of 50 to 70 feet per minute, and another machine of the same model which is now cleaning steel golf shafts at rate of six per minute.

The Athenia Steel Company, who manufacture a very high grade of high and low carbon cold rolled strip steel, to improve their product and cleaning conditions installed the first Model RS Standard Patent Automatic Scouring Machine which is shown in the picture taken at their plant. The pulling roll with compressed air control and special type of eight reel winder are also a new design made by The Standard Equipment Company, Inc., for handling the one to eight strands of stock through the scouring machine.

This machine will take a continuous feed of one or more strips up to 7 in. wide and is cleaning two sides and edges of hot rolled high carbon steel at rate of 35 to 45 feet per minute and annealed and tempered stock at 40 to 60 feet per minute in one pass, the makers claim.

The control levers for operating the pulling roll is in easy reach of the stock supply man at front end of machine, the corresponding lever thrown down will grip and release pull on the respective strand holding it stationary for welding on a new strand or coil.

Each Winding Drum or Reel is provided with a clutch foot lever control to stop for removing the finished coil and take up and wind new coil coming through.

The abrasive or sand in the scouring machine is used over and over, the dust is removed by exhaust system into a cloth screen dust arrester, so that the operators are not exposed to any dust conditions while operating. A machine is now being designed which will take one or more strands of stock up to 14 in. wide. Wider models are contemplated. The model RS and RT scouring machines will also handle wire and rod up to about ½ in. diameter in any number of strands equal to the width or capacity of the scouring chamber.

The Standard Equipment Company, Inc., owns the patents covering these machines.

Oxide-Free Aluminum

The National Bronze and Aluminum Foundry Company, Cleveland, Ohio, state that about eighteen months ago they succeeded in developing and patenting a new and radical method of producing aluminum free of oxides by means of which a marked increase in the physical properties of the metal has been made possible.

During the past year this metal has been placed on the market under the name of Tenual and, according to the makers, it has met with such universal favor among the users of aluminum castings that the demand has exceeded the maximum production capacity built up during 21 years of the company's activity. The company has, therefore, just broken ground for a large addition to its plant.

This will increase the present production capacity by fifty per cent. A good deal of the necessary equipment has already been purchased, but, according to J. H. Shafner, president of the firm, more will undoubtedly be needed before the new building is entirely utilized.

Zinc Alloy Roofing

The New Jersey Zinc Sales Company, 160 Front street, New York, is placing on the market a new type of non-rusting metal roofing and siding called Zilloy. This is an alloy of zinc base, uncoated, with small percentages of other non-ferrous metals.

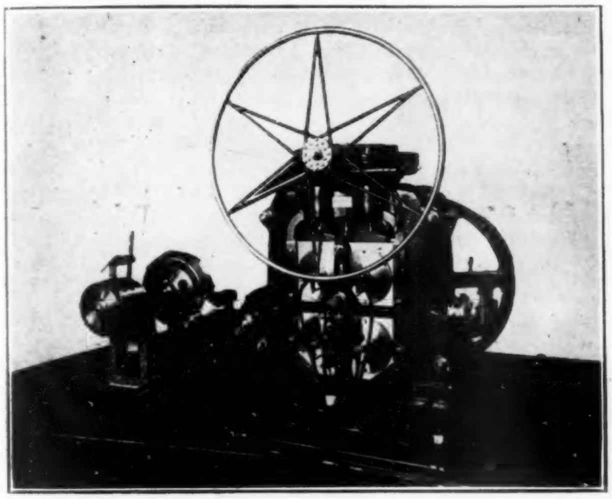
Zilloy is said to require no special methods of application. Sheets are fastened to the frame by strips and rivets in standard fashion. They have sufficient flexibility to allow their conforming to the usual unevenness found in industrial building construction. Protection against lightning can be obtained by making at least two metallic connections between the covering and the moist earth.

Zilloy is said to have enough strength to eliminate sag or "creep" which occurs in so many roofing installations due to snow load, dust accumulations, etc.

Full details of methods of application of Zilloy corrugated and other roofing sheets are supplied by the New Jersey Zinc Sales Company.

Cluster Mills

Cluster mills are fairly well known as rolling mills with two working rolls of comparatively small diameter backed up by four mills of large diameter which prevent the small rolls from springing. Such mills have been in use for about thirty years in Switzerland, for rolling high carbon strip steel to be used as springs in watches and clocks. They have never been very generally successful, however, for various reasons.



Cluster Mill

After some preliminary work which had to be dropped in 1914 because of the World War, the Walzmaschinenfabrik August Schmitz, Dusseldorf, Germany, developed a line of cluster mills up to fifty inches wide, which are said to be giving extraordinary results.

Eight inch brass strips, for instance, have been rolled in two passes from .060" to .017" with no intermediate annealing, whereas normal two high mills will require at least four passes with one intermediate annealing to do the same job.

A strip 4½" wide has been rolled in three passes from .024" to .0045" without any intermediate annealing, whereas on normal two high mills seven passes at least are necessary with three annealings.

The edges of the rolled strips remain absolutely clean and are not torn at all, which is the best proof that the reductions have not been exaggerated.

The big backing up rolls are placed in roller bearings, whereas the small working rolls have no bearings at all, as they are being kept in position by the backing up rolls. There is consequently no consumption of oil for the lubrication of the bearings, the roller bearings running in grease which will always last for a couple of months and the small rolls working with bare necks without bearings.

There is still another advantage in new mills, that is that the metal turned out is much more uniform in thickness than it has been possible hitherto to produce. The bending through of the working rolls or the spring is next to nothing, so that every guarantee can be given that the tolerance in gauges will not be more than a quarter of a thousandth of an inch all over the full width of the strip or sheet.

These new mills are now brought on the market in different sizes by the firm Schmitz and Company, Fabrique de Laminoirs, Thun, Switzerland, with their main works in Dusseldorf; also Walzmaschinenfabrik August Schmitz, Dusseldorf. These firms are represented in the United States and Canada by F. W. Jaeger, 140 Liberty Street, New York.

Chemical Industries Exposition

The Twelfth Exposition of Chemical Industries will be held at the Grand Central Palace, New York City, May 6 to 11, 1929, opening at 2 p. m. the first day and at 12 noon each day thereafter. At the last exposition 75.145 manufacturing executives, chemists, engineers and other employes in forty-odd industries attended, coming from all parts of the world. The exhibits include raw materials, manufactured products, minerals, machinery and equipment and educational features. There will be professional sessions and a program of addresses. Some addresses of interest to the metal and finishing field will be made.

Equipment and Supply Catalogs

Multiple Retort Underfeed Stoker. Combustion Engineering Corporation, New York City.

Ajax-Northrup Electric Furnaces. The Ajax Electrothermic Corporation, Trenton, N. J. Bulletin 4a, showing metal melting methods.

Bristol's Automatic Electric Control Valves. The Bristol Company, Waterbury, Conn. Motor and magnet operated types are described.

Grinding and Sharpening Machinery. Samuel C. Rogers and Company, 191 Dutton Avenue, Buffalo, N. Y. Complete 1929 illustrated catalog and price list.

Exterior Lighting and the Use of Lanterns. Artistic Lighting Equipment Association, 711 Graybar Building, Lexington Avenue, New York City. Booklet illustrated in colors.

Daniels Plating Equipment. The Daniels and Orben Company, Inc., 81 Walker Street, New York City. Various types of mechanical plating apparatus. Illustrated pamphlet.

Good for 41 Years. E. Reed Burns Manufacturing Corporation, Brooklyn, N. Y. Leaflet on the history and activities of the company, which manufactures polishing and buffing supplies of all types.

Black and White. E. F. Houghton and Company, Philadelphia, Pa. The March issue of the company's publication, containing "Psychology Goes to Work," an interesting article by Dr. Donald A. Laird, industrial psychologist.

Coming-of-Age Celebrations. The Institute of Metals, 36 Victoria Street, Westminster, London, England. A booklet on the recent event which took place in London on the completion of the British Institute's twenty-first year of activity.

Finishing Research Advisory Service. Finishing Research Laboratories, Inc., 1164 West 22nd Street, Chicago, Ill. Pamphlet describing the services offered and advantages to be derived therefrom.

Advertisements which Reflect the Scope of R and H Chemicals and Service. The Roessler and Hasslacher Chemical Company, 10 East 40th Street, New York City. Interesting 24-page illustrated booklet showing the company's various advertisements.

Man's Conquest of the Air. Midwest Air Filters, Inc., Bradford, Pa. A booklet by Stig G. Sylvan, research engineer of the company, and Prof. Samuel E. Dibble, Carnegie Institute of Technology. Interesting and important technical data on air cleaning.

Mond Nickel Bulletin. American Mond Nickel Company, Pittsburgh, Pa. February issue of the company's publication. A summary of current information on nickel. Contains an interesting article on The Electrodeposition of Nickel, outlining recent notable advances in this art.

Review of the Silver Market for 1928. Handy and Harman, New York. This is the annual review of the silver market which has been issued by this firm for many years and become recognized as one of the most authoritative summaries on silver. It is their judgment, barring unforeseen developments, that the average price level of silver during 1929 will not be far distant from that of 1928.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

American Electroplaters' Society

Los Angeles Branch to Be Formed

HEADQUARTERS, CARE OF M. D. RYNKOFS, 1350 WEST 25th STREET, LOS ANGELES, CALIFORNIA

Will Ask for Charter

Twenty-five Pacific Coast platers have signed their names to an application for a charter to form a branch of the American Electroplaters' Society at Los Angeles. At a meeting held on February 4, 1929, at the Los Angeles Y. M. C. A., a very interesting technical session was held, and papers were read on cadmium plating and plating on aluminum. These were followed by a lively discussion.

Any planter in California is cordially invited to join the Los Angeles Branch. Those wishing to do so may write to the secretary at the address given above.

—M. D. RYNKOFS, Secretary-Treasurer.

Bridgeport Branch

HEADQUARTERS, CARE OF WILLIAM EHRENCHRONA, 872 HANCOCK AVENUE, BRIDGEPORT, CONNECTICUT

Annual Session and Banquet

As previously announced, the Bridgeport Branch, American Electroplaters' Society, will hold its annual educational session and banquet at the Stratfield Hotel, Bridgeport, Conn., April 27, 1929. The following program has been arranged for the session:

The Aim of the Society, by Horace Smith, Supreme President.

Determination of the Buffer Properties of the Nickel Plating Bath, by Carl Pitchner.

Question Box, conducted by George B. Hogaboom. This will cover discussion of problems presented by platers and manufacturers.

Simplified Methods of Chemical Control, by Dr. L. C. Pan.

All platers, plant officials, manufacturers, chemists and others interested in electroplating methods are urged to attend this session and also the banquet in the evening. The session starts at 2:30 p.m. and the banquet at 6:30 p.m.

—R. L. O'CONNOR, Chairman.

Rochester Branch

HEADQUARTERS, CARE OF C. GRIFFIN, 24 GARSON AVENUE, ROCHESTER, NEW YORK

Annual Session and Banquet

The Rochester Branch, American Electroplaters' Society, will hold its annual educational session and banquet Saturday afternoon and evening, April 13, 1929, at the Powers Hotel, Rochester. The session starts at 3 p.m. and the banquet at 6:30 p.m. The announcement in the previous issue contained a complete statement of the arrangements for this event.

American Electrochemical Society

HEADQUARTERS, CARE OF COLIN G. FINK, COLUMBIA UNIVERSITY, NEW YORK CITY

The 55th Meeting of the American Electrochemical Society will be held at Toronto, Canada, on Monday, Tuesday, Wednesday, and Thursday, May 27, 28, 29, and 30, 1929. Reduced railroad fares go into effect May 15.

The headquarters of the meeting will be the University of Toronto. The spacious, well-equipped dormitories will be at the entire disposal of the visiting members and guests. Elaborate facilities are available for the technical sessions and discussions. Meals will be served in the world-famous Hart House.

Reservations for rooms should be sent as soon as possible to Prof. Jas. T. Burt-Gerrans, Toronto University.

The program of the meeting, now in preparation, will be published in the May issue.

National Association of Purchasing Agents

HEADQUARTERS, 11 PARK PLACE, NEW YORK CITY

Approximately fifteen hundred industrial buyers will study the latest wrinkles of their profession at the fourteenth annual meeting of the National Association of Purchasing Agents to be held at the Hotel Statler, Buffalo, New York, from June 3rd to 6th inclusive. The convention will attract the keepers of the purse strings in practically every industry in the United States, Canada, and Mexico, whose combined buying power annually runs in the billions. These industrial buyers will study commodity trends and business conditions, up-to-the-minute purchasing practices, new sources of supply, new services, and new products. Apart from the general sessions, a great deal of time will be allotted to the various industrial groups within the Associations so that they may convene on their common interests.

Supplementing the convention itself, there will be an exhibit of industrial equipment, services, and improved products. This is called the "Informashow" because of its informative character. The show is of unusual merit and affords each purchasing agent an opportunity to keep abreast of developments and in the past has proved very educational.

American Welding Society

HEADQUARTERS, 33 WEST 39TH STREET, NEW YORK CITY

The annual meeting of the American Welding Society, to be held April 24 to 26, inclusive, at the Society's headquarters, will include a number of technical sessions of interest to welders and industrial men interested in welding of any form. There will be a session Friday morning, April 26, at 10 a.m., at which the following papers on non-ferrous subjects will be presented:

A Symposium on Welding in Chemical and Process Industries.

Welding Aluminum in the Chemical Industry, by W. M. Dunlap, Aluminum Company of America.

The production of Ductile Welds in Nickel and Monel Metal, by N. B. Pilling, International Nickel Company.

Waste Material Dealers

HEADQUARTERS, TIMES SQUARE BUILDING

The National Association of Waste Material Dealers held their 6th annual convention in Chicago, Ill., on March 19th and 20th, 1929. Henry Lissberger was elected president.

The Metal Division held its meeting at the Congress Hotel on March 20th, E. G. Jarvis presiding. T. A. Wright of Lucius Pitkin, Inc., New York, reported for the special committee on definitions and terms used in the scrap metal industry. It was voted that this report be approved and given wide publicity.

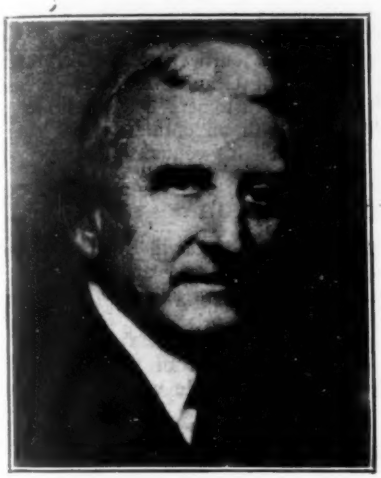
Another important matter was the approval of a resolution presented by George Birkenstein for the prosecution of dealers who repudiated contracts.

Benjamin Friedman was elected chairman of the Division for the year ending March 24th, 1930, and a rising vote of thanks was given to the retiring chairman, Mr. Jarvis, for his industry and information as chairman during the past year.

Personals

F. S. Chase

Frederick Starkweather Chase, president of the Chase companies, Incorporated, and Chase Brass and Copper Company, was born in Waterbury, Conn., July 2, 1862, the son of Augustus Sabin and Martha (Starkweather) Chase; was graduated from Phillips Andover Academy in 1883; A.B., Yale, 1887. Mr. Chase spent a year in Germany before graduating from Yale. He was married to Elsie Rowland on February 17, 1890. They have the following children: Ethel Rowland Chase (Mrs. Robert L. Coe), Helen Starkweather Chase (Mrs. Rufus R. Rand, Jr.), Augustus Sabin Chase, Edmund Rowland Chase, Fredrika Chase and Justine Whittemore Chase.



F. S. Chase

Mr. Chase began with the Waterbury Manufacturing Company in 1887, working in most of its departments and getting a practical understanding of the business; he became its secretary in 1895 and treasurer of the Chase Rolling Mill Company when it was founded in 1900. He became treasurer of the Chase Metal Works when it was organized in 1911 and president of the Chase companies, Inc., in 1918. He is also president of the Consolidated Safety Pin Company, a director of the Citizens-Manufacturers National Bank, Waterbury Gas Light Company, Waterbury Clock Company, Automobile Mutual Insurance Company of America, Factory Mutual Liability Insurance Company, What Cheer Mutual Fire Insurance Company and Hope Mutual Fire Insurance Company; president of the Waterbury Hospital; Junior Warden of St. John's P. E. Church; Agent, Bronson Library, and a vice-president and director of the Copper and Brass Research Association. He is also a member of the American Society of Mechanical Engineers, Delta Kappa Epsilon, Scroll and Key, Rotary, University and Waterbury Country Clubs, Graduate and Elizabethan Clubs of New Haven and the Yale Club of New York.

—W. R. B.

O. B. Wilson has been placed in charge of the Cleveland office of the Brown Instrument Company of Philadelphia, with headquarters at 819 Hippodrome Building, Cleveland, Ohio. Mr. Wilson has been with the company for five years, during which he was identified with the New York and Chicago offices of the company, which manufactures temperature control and other electrical apparatus for manufacturing plants, foundries, etc.

Horace E. Hall has been appointed sales manager for the Zeller Lacquer Manufacturing Company, 20 East 49th Street, New York City.

Arthur G. Eaton has been appointed vice-president and director of sales for Aluminum Industries, Inc., Cincinnati, Ohio, manufacturers of aluminum pistons, etc. Mr. Eaton formerly was identified in various executive capacities with Dodge Brothers, Inc., where he served for fifteen years, the last four of which were spent as director of purchases for the Dodge company.

H. D. Wilkinson has been appointed a representative for the Liquid Metal Products Company, 231 LaSalle Street, Chicago, Ill., manufacturers of metallic dipping solutions for metals and metallic surfaces.

John J. Dervan, who has been associated with the American Tube Works, Boston, Mass., for many years, has been elected treasurer and general manager of the corporation. The following have been elected to the board of directors: **E. A. Cotton, Walter B. Grant** and **John J. Dervan.**

Henry W. Armstrong

The board of directors of the Joseph Dixon Crucible Company, Jersey City, N. J., at their regular meeting March 18, 1929, elected Henry W. Armstrong treasurer of the company, to succeed the late William Koester.

Mr. Armstrong, a native of Jersey City, entered the employ of the Dixon Company in 1903 as office boy and later became a stenographer in the export department, finally being transferred to the crucible sales department.

H. W. Armstrong

In 1917, he was practically the first man drafted in the State of New Jersey, his draft number being the second drawn. He was assigned to the 312th Infantry of the 78th Division, where his ability was soon recognized and he was made regimental sergeant-major. He served with this organization through its entire activity. His modesty has prevented us from getting accurate information, but there are well defined rumors of several citations. Upon being mustered out of service, he resumed his old position with the Dixon company, which he held until July, 1920, when he was appointed to the position of credit manager. In 1926 he was elected assistant treasurer of the company.

Mr. Armstrong for many years has been a member of the Northern New Jersey Credit Men's Association and has also served as its vice-president. He is a member of the New York Association of Credit Men and a regular attendant of the conventions of the National Association of Credit Men. He has served on many important national committees, including a special committee on the revision of the Credit Men's Association diary and manual of commercial laws.

L. Eugene Punderson, 1859 Sheldon Road, Cleveland, Ohio, has joined the International Chemical Company, Philadelphia, Pa., as sales engineer in the northern Ohio territory. Mr. Punderson is a graduate of Yale University and by training is a chemist and a mechanical engineer. Mr. Punderson organized and ran the chemical laboratories of the Winton Motor Car Company for a number of years. During the war, he organized and successfully ran the Punderson Laboratories in Cleveland. These laboratories did special chemical work for the metal industry throughout northern Ohio. Later, Mr. Punderson did special work at the Pittsburgh Testing Laboratories of Pittsburgh, Pa.

J. C. Lincoln, formerly president of The Lincoln Electric Company, Cleveland, Ohio, has been elevated to the position of chairman of the board of directors. **J. F. Lincoln,** formerly vice-president, has been promoted to the presidency.

At the annual stockholders' meeting of The Alexander Milburn Company, **E. P. Boyer** was elected vice-president. Mr. Boyer became associated with the company in 1919 as its Philadelphia district manager. In May, 1926, he established The Milburn Sales Company, handling the Philadelphia territory, and later the New York and Chicago sales. Late in 1929 Mr. Boyer was elected vice-president of The Milburn Sales Corporation and The Milburn Paint Spray Corporation, which are the distributors for all of the products of The Alexander Milburn Company. Mr. Boyer is spending a large part of his time at the Baltimore offices of the company.

Ernest V. Pannell, consulting electrical and metallurgical engineer, is now occupying offices in the Chanin Building, 122 East 42nd Street, New York, N. Y.

Ellis E. Edwards has joined the International Chemical Company, Philadelphia, Pa., as sales engineer in the Wisconsin territory. Mr. Edwards is a graduate of Oberlin College and has been actively engaged in the metal industry for the past fifteen years.

H. E. Haring has resigned his position with the Victor Talking Machine Company to engage in electrochemical research at the Bell Telephone Laboratories, New York City.

Obituaries

John Clark Codman

John Clark Codman, treasurer and manager of the F. L. and J. C. Codman Company, Inc., South Boston, Mass., manufacturers of buffing and polishing wheels, died February 7, 1929, after a short illness. A short obituary notice appeared in our previous number, since the issue of which a more detailed account of his business career has become available.

Mr. Codman became the partner of Franklin L. Codman, his cousin, in 1891, after the latter had purchased the J. B. West Company, then one of the oldest buff manufacturing concerns in the country. In 1911 Franklin Codman died and from that time John Codman operated the company until his death recently.

Mr. Codman is survived by his widow, a son and a daughter, two brothers and a sister.

John Clark Codman

Jesse J. Bowen

Jesse J. Bowen, district sales engineer for the Pangborn Corporation, Baltimore, Md., died suddenly on February 25, 1929, at his home in Rochester, N. Y. Mr. Bowen was 57 years of age and had the distinction of being the first field representative of the Pangborn Corporation, large producers of sand-blast and dust-collecting equipment. He joined the company in 1906. He was widely known in the foundry industry throughout New England, Illinois, Wisconsin, New York and Pennsylvania.

In his early days Mr. Bowen was a journeyman molder, understanding the production as well as the cleaning methods of castings, which made his service to his customers entirely practical. He was enthusiastic in his work, with an optimistic and sunny disposition that won him friends in all his contacts.

Edward Lupton

Edward Lupton, president of the firm of David Lupton & Sons, Philadelphia, Pa., manufacturers of hardware and other metal products, died at his home in Jenkintown, a suburb of Philadelphia, on February 21, 1929.

Mr. Lupton was a past president of the Builders' Exchange of Philadelphia and he was third vice-president of the Ornamental Iron and Bronze Association of America. He was 61 years old.

News of the Industry

Industrial and Financial Events

American Brass Company Expansion

The American Brass Company, Waterbury, Conn., has acquired the French Manufacturing Company, also of Waterbury, a manufacturer of small gage brass and copper tubing. The French company's plant employs 335 men and has an annual payroll and materials expense of $2,000,000 approximately. The company formerly bought about 10,000,000 pounds of metal annually from the American Brass Company. The companies were not competitive, the French concern making very small tubing that was not produced by the American Brass.

Other expansion of the Anaconda Copper Mining Company, which is the parent concern of the American Brass Company, is contained in a despatch from Pawtucket, R. I., stating that the Anaconda has acquired the Tubular Woven Fabric Company there, a transaction involving more than $1,000,000. The acquired company makes tubular webbings, but its principal business is the manufacture of insulated wire, metal covered electrical insulators and conduits. Its gross earnings last year are stated to have been about $1,000,000.

Golden Jubilee of Electric Light

The international celebration of the Golden Jubilee of Light—marking the 50th anniversary of the invention of the incandescent light bulb by Thomas A. Edison—will be inaugurated in Atlantic City on the evening of May 31, 1929. In addition to opening the world-wide festival of light, the event will initiate a brilliant light display throughout the entire resort and approaching highways to last until October 21, the anniversary date.

May 31 will also mark the beginning of an official celebration of Atlantic City's diamond anniversary as a duly incorporated community, as well as the formal opening of the Atlantic City auditorium, the largest convention hall in the world.

On October 21, 1879, Thomas A. Edison, from his laboratories at Menlo Park, N. J., announced the invention of his incandescent lamp, making possible the development of the electric light and power industry. During this year—the 50th anniversary of this epochal event—electric light and power companies of America and other lands, with billions of dollars in resources, are joining in staging an elaborate celebration in every community.

Big Gain in Brass Pipe Sales

Sales of brass pipe reached the unprecedented total of 76,777,400 pounds in 1928, or almost 5 times the poundage sold in 1922, according to statistics just compiled by the Copper and Brass Research Association. The total for 1928 was approximately 14,000,000 pounds above the total for 1927, this being one of the largest gains in a single year since consumption of brass pipe (IPS) assumed large proportions.

In 1922 sales were 16,016,500 pounds, so that the total for 1928 represents a progressive increase to an additional 61,000,000 pounds in yearly consumption. On a percentage basis the gains over 1922 were 5 per cent in 193, 61 per cent in 1924, 145 per cent in 1925, 234 per cent in 1926, 293 per cent in 1927, and 379 per cent in 1928; this amounts to an average gain of 74.8 per cent annually since 1923.

Welding School Expands Facilities

To meet the rapidly increasing demand for practical instruction in arc welding, the Welding School maintained by The Lincoln Electric Company is . greatly expanding its facilities. While students of the school are carefully selected as to seriousness of purpose, it will probably be necessary to more than double the amount of welding equipment before the end of the current year. At present there is a waiting list of constantly increasing length and it is to take care of the urgent demand by manufacturers for more skilled arc welders that the present expansion is being made by the school.

The course given is of six weeks' duration and is intensely practical in character. Students are required to conform to ordinary shop rules and must keep the conventional shop hours. The progress of an individual student is limited only by his own aptitude and application since individual rather than class instruction is given.

It frequently happens that experienced arc welders will spend from a week to ten days in a sort of extra curricular course to learn special work where they feel their experience to be insufficient for a contemplated project. The Lincoln Welding School is under the direct supervision of Arthur E. Madson.

Copper in Oil Burners

Approximately 5,000,000 pounds of copper are consumed annually in the manufacture of oil-burning installations for heating purposes and power production, according to a survey just completed by the Copper and Brass Research Association. The survey discloses a striking recent exploitation of the field for household oil-heating apparatus. In 1919 the first approved oil-heater for homes was listed. Five years later there were less than a dozen approved types. Today some 100 types of domestic oil heaters are sanctioned by the fire underwriters.

Sales of these domestic installations now total about 100,000 units per year. As the potential market for household oil-heaters is estimated at 2,000,000 new units, an extensive field for expansion is afforded to the manufacturers of the domestic apparatus.

Copper, mainly in the form of its alloy, brass, is used for approximately 100 parts of the various assemblies in the several types of equipment. As much as 25 pounds of brass is used in some types of domestic apparatus, with an average of 10 pounds of brass and 2 pounds of copper. Some models of industrial equipment use 50 pounds of brass and average 17 pounds of brass and 3 pounds of copper.

Present rate of development in the oil-heating industry points to a copper consumption totaling 7,000,000 pounds per year in the production of parts for oil heaters.

Dress Sprayed with Pure Gold

A display of dresses to be worn by debutantes to be presented at the first Royal Court in Great Britain May 9, brought out several unique uses for precious metals, mainly gold, a London dispatch states. One of the dresses shown was sprayed with about $300 worth of pure gold weighing about one pound. The dress is of satin and taffeta and will shine like a coat of mail. Another gold-adorned dress has a subdued sheen which gives the appearance of solid metal but which is stated to be as flexible as silk.

Yale and Towne Manufacturing Company

Net profits of the Yale and Towne Manufacturing Company for the year ended December 31, 1928, were $2,152,631 after taxes, as compared with $1,939,751 for the preceding year, according to the annual report of the company. The net sales for the year were $17,555,261, for which no comparative figure is available, the reporting of sales having been started this year. In the annual statement to stockholders, President Walter C. Allen said: "Trading during 1928 was more severely competitive than for many years past. Price reductions were necessary to meet this competition and the policy of striving to increase efficiency and secure economies was intensified with the result that directors feel the profits shown are highly satisfactory. The company is now the largest lock and door closer manufacturer in the world, operating five plants in the United States, two in Germany and one in Canada."

Monel Metal Sink Design Contest

The prizes in the competition for design for kitchen sinks in Monel Metal offered through the Art Alliance of America by The International Nickel Company, were awarded to the following:

First prize of $1,000 to W. Wallace Ferguson, Jr., 1641 Commonwealth Avenue, Boston, Massachusetts.

Second prize of $500 to William Brodsky of Pennsylvania Museum and School of Industrial Arts, Philadelphia, Pennsylvania.

Third prize of $300 to Mrs. Helen Strangeland, 947½ W. 68th Street, Los Angeles, California.

Fourth prize of $100 to Max R. Uhlig, 191 Albemarle Street, Springfield, Massachusetts.

Fifth prize of $100 to C. Edwin Josselyn, 84 Redland Road, West Roxbury, Massachusetts.

About five hundred designs were submitted, the general level of craftsmanship shown being very high. The first prize was won by a sink of very simple design, having two drawers on the right and one drawer on the left, fitted under the drainboards. This sink had one basin and was supported only from the wall. The design showed the sink to be built away from the wall and it was not fitted with a splashboard. The drainboards had no grooves but were slightly inclined to facilitate draining. This sink was one of the most simple designs submitted.

General Electric Annual Report for 1928

Earnings of the General Electric Company for 1928 amounted to $54,153,806, equivalent, after dividends on the special stock, to $7.15 a share on the 7,211,481 shares of no par common stock, the annual report of the company made public by President Gerard Swope discloses. This compares with $6.41 a share in 1927.

Orders received during the year 1928 were $348,848,512, compared with $309,784,623 in 1927, an increase of 13 per cent, and unfilled orders at the end of the year were $72,953,000, compared with $68,916,000 at the close of 1927, an increase of six per cent.

Doehler Die Casting Company

The Doehler Die Casting Company, New York, report snet profits of $608,380 after depreciation, federal taxes, etc., for the year 1928, as compared with $389,577 in the preceding year. Net sales reported were $8,341,253 in 1928 against $6,640,729 for the previous year.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Conn.

April 1, 1929.

Negotiations are in progress for the merger of the **Waterbury Fastener Company** and the **United States Fastener Company** of Boston. The local concern is capitalized at $200,000 and the Boston firm at $1,000,000. While plans for the future are indefinite, it is said that the glove fastener business may be moved to Boston but that the manufacture of handbag fasteners and of frames for novelties will be continued here. The local plant employs between 150 and 160 hands. The company was incorporated in 1917, **Walter Pullen** and **Michael Keeley** being the principal owners. The present stockholders acquired it in 1918. The principal ones are **George Pullen, Morris Goldberg, Malcolm J. Ford, John Draher and Max Kiessling.** A few years ago the plant was practically gutted by fire; the company then purchased the former Welch Hosiery plant in Waterville, a suburb of this city.

Clark S. Judd, former Naugatuck valley resident, has returned to this section after an absence of 19 years to become vice-president of the entire American Brass Company, in charge of manufacturing in all the plants. He has been vice-president in charge of the Kenosha, Wis., branch of the company. His new position is one newly created by the directors of the company. He began in the sheet brass department of the Torrington mill in 1903, becoming assistant foreman in 1905, and assistant superintendent in 1908. In 1910 he was sent to Kenosha as superintendent and in 1920 he was made vice-president in charge of that plant. As vice-president in charge of manufacturing in all subsidiaries, he will maintain his principal office in this city.

The Chase Brass and Copper Company office here has denied reports that on completion of the new Cleveland plant 600 Waterbury families will be moved there. Only "key" men will be sent there from this city, a few in number, to supervise the operations. Most of the employes will be recruited from Cleveland and Detroit, it is declared.

The United States Employment Service reports that in Waterbury all plants are operating at capacity, that skilled labor is scarce and that the surplus of unskilled labor is small. The metal working establishments in particular, it states, are very busy and are looking for more skilled artisans.

Representatives of local clock makers are presenting statistics in Washington showing the need of a higher tariff on clocks and watches to protect local manufactures from German competition. A clock made in Germany for $1.70, they show, can be brought to this country at a total cost of $2.27 and sold in local stores for $30 in competition with local clocks, returning a profit to the makers of over 1,000 per cent.

Local Anaconda stockholders have been offered the right to subscribe for two additional shares of stock at $55 a share for every five shares now held. At a recent stockholders' meeting it was voted to double the present stock by increasing the number of shares from 6,000,000 to 12,000,000, the proceeds to be used to wipe out the $103,803,000 first consolidated, Series A, 6 per cent mortgage bonds due in 1953. Offers of new stock are made to the stockholders of record of April 30 and will expire June 18.

Frederick S. Chase, president of the **Chase Companies, Inc.**, has suggested that the Connecticut Manufacturers Association take up with the state highway department the matter of using discarded cable for highway guard fences. It would be economy for the state and at the same time afford manufacturers an opportunity of disposing of discarded cable at considerably higher prices than they now receive by selling it for scrap.

Officials of the American Pin division of the **Scovill Manufacturing Company** state that business this year is very good, particularly in the manufacture of plumbing goods and fixtures. Plant operation at Waterville is above normal and stocks are normal. The labor situation is encouraging and the wage scale seems to be satisfactory. Jobbers of plumbing supplies are not carrying any large amount of stock.

The Chase Companies, Inc., are the assignees of a patent from **Albert Hagel** of Newark on a "wrist pact."

—W. R. B.

Connecticut Notes

April 1, 1929.

BRIDGEPORT—The American Tube and Stamping Company has begun the erection of a modern hot roll strip mill at its Stratford Avenue plant. It will be about 360 feet long. The aim is to concentrate production and provide for the large increase of work now being executed by the Bridgeport plant.

Stockholders of the **Magazine Repeating Razor Company**, now engaged in production at the **American Chain Company's** plant, have approved plans for reorganization. The company has offered to stockholders of record March 8 note purchase warrants entitling them to purchase before December 31, 1929, its 10 year 6 per cent notes, convertible into Class B stock. Notes totalling $700,000 have been underwritten and it is expected stockholders will subscribe $300,000 more, thus giving the company $1,000,000 in working capital.

Directors of the **Bryant and Chapman Company** have voted the regular quarterly dividend of 65 cents a share payable April 1 to stockholders of record March 20.

The American Chain Company has been granted an injunction against the **Stewart-Warner Corporation** forbidding the sale of loop-end parallel star bumpers as infringement on a patent held by the local company.

The Cosmic Aircraft Corporation has been organized here with a capital of $20,000 and is looking for a factory site to start the manufacture of airplanes. The incorporators are **Ogden Marsh, A. Everett Hughes, Beatrice Leveen, and Paul S. Chapman.**

Production of the Avro-Avion airplanes for the **B. Rowe Company** of Manchester, England, has started at the plant of the **Whittlesey Body Company.**

The Sikorsky Aviation Company plans to build a larger factory on the site it has purchased here than originally intended. Production schedules for 1929 call for a 10 fold increase over last year.

The stock of the **Bullard Company,** successor to the Bullard Machine Tool Company is now listed on the New York Stock Exchange and is being traded in. The company's annual statement for 1928 shows net earnings after all charges of $1,412,027 or $5.11 a share.

The annual report of the **Dictaphone Corporation** for 1928 shows net profits of $611,475 after all charges for production, depreciation and taxes or equivalent, after preferred dividends, to $4.87 per share on the 103,750 shares of no par value.

NEW BRITAIN—The American Hardware Corporation earned $5.17 per share on the 426,000 shares of $25 par value common during 1928 according to the annual report just made. This compares with $5.06 per share earned during 1927. Net earnings after depreciation and other charges amounted to $2,566,902 compared with $2,510,381 the year before.

Stockholders of the **New Britain Machine Company** are asked to ratify the directors' recommendation that it be merged with the **Gridley Machine Company** of Hartford.

Maxwell Coe, of Liberty Street, has been appointed manager of the Stanley Rule and Level division of the Stanley **Works, President Clarence F. Bennett** has announced. Mr. Coe has been superintendent of the plant. In his new position he will assume some of the duties performed by **Philip B. Stanley,** who resigned as vice-president last month.

The Stanley Works has declared its regular quarterly dividend of 62½ cents a share, payable April 1 to stockholders of record March 16.

The Stanley Works is demanding that adequate protection be given its water power development at Rainbow by the city of Hartford or it will oppose Hartford's proposed reservoir development there. If Hartford diverts any of its water supply the company expects compensation.

BRISTOL—Directors of the **Bristol Brass Company** have declared the regular quarterly dividend of $1.75 a share on the preferred stock and $1.75 on the accumulated preferred dividends. This reduces the accumulated amount to $17.50 per share. Payment will be made April 1 to stockholders of record March 15. The company so far this year has paid $7 on the accumulated dividends, payment of $5.25 having been made in January.

The company's business is reported as excellent and more than 3,000,000 pounds of brass are expected to be turned out this month. **Secretary-Treasurer A. D. Wilson** was elected vice-president and treasurer at the meeting last month, filling the vacancy created by the death of **J. R. Holley. Harry M. Law** was elected secretary. Mr. Wilson and Mr. Law have been with the company 23 years.

The new building program of the **New Departure** Company outlined in last month's issue has been started.

HARTFORD—Colt's Patent Fire Arms Company is operating the Johns Pratt division on a 21-hour day schedule in production of Coltrock products, and the gun plant is operating on full time.

"Carboloy," the new alloy which cuts hardened tool steel, glass and hard porcelain and will scratch sapphire, was demonstrated at last month's meeting of the Engineers Club by **G. N. Sieger**, vice-president and secretary of the P. R. **Mallory Company.** His company is connected with the **Carboloy Company**. The alloy is being developed by the **General Electric Company.**

One hundred and twenty-five members on the active list and four on the retired list attended the dinner of the Colt's **Fire Arms Twenty-Five Year Club** at Colt Memorial Hall last month. The oldest member of the club is **George** Green, employed by the company since 1864, and the next oldest employes are **James S. Stevens** and **Richard Broomhall**, who have been employed since 1872. Company officials who are members of the club are **Frank Nichols,** vice-president and treasurer of the company; **Arthur Ulrich,** secretary; Harold **Fairweather,** assistant treasurer; **Dwight G. Phelps,** general sales manager; and **Frederick T. Moore,** general works manager.

MERIDEN—The International Silver Company reported net profits of $1,656,824 after all charges, including depreciation for 1928, compared with $1,857,854 for 1927. Earnings

were equal to $13.54 a share against $23.61 on fewer shares in 1927.

Manning, Bowman and Company have declared dividends of 37½ cents a share on the class A stock.

Over 175 foremen of the **International Silver Company** factories of this and nearby cities attended a meeting of the Foremen's Association here March 13th, at which **John A. Coe,** president of the **American Brass Company,** made an address on progress in industry. He urged them not to be "yes" men but to do some original thinking about their jobs. American industry must start a new course of spiritual and educational control of production instead of merely material methods, he said.

TORRINGTON—The regular quarterly dividend of 75 cents a share has been declared by the **Torrington Company** and will be payable April 1 to stockholders of record March 20.

About 75 attended the banquet of the **Hendey Machine Company** March 24th. **John A. Coe,** president of this company and of the **American Brass Company,** sent a message of greeting. Prizes were presented the recent winners of the bowling tournament.

THOMASTON—Stockholders and directors of the **Seth Thomas Clock Company** were reelected at the annual meeting last month. The present **Seth Thomas** is the fifth of the name to head the company since it was founded.

WINSTED—**The Manufacturers' Association** is planning a series of monthly trips of inspection of the local factories. The plants which will be visited are the Winsted Edge Tool Works, Winsted Hardware and Manufacturing Company, William L. Gilbert Clock Company, Fitzgerald Company, Strong Manufacturing Company, Union Pin Company, Winsted Manufacturing Company and Strand and Sweet Manufacturing Company.

SOUTHINGTON—**The Walker-Steward Foundry Corporation** has filed a petition in bankruptcy with the clerk of the United States District Court at New Haven. Liabilities are listed at $50,089.98 and assets at $51,466. The corporation has specialized in castings for several years. About 75 men were employed until about four weeks ago. **Victor E. Walker** of Meriden is president of the corporation. It occupied a building formerly occupied by a branch of **Peck, Stow and Wilcox.**

KENSINGTON—**The Goss and DeLeeuw Automatic Chucking Company** declared a regular dividend of two per cent, payable April 1 at its annual meeting held last month. Officers and directors were reelected.

STAMFORD—**Yale and Towne Manufacturing Company** reports for the year 1928 net profits of $2,152,631 after depreciation and federal taxes, compared to $1,939,751 for 1927. Earnings for 1928 were $4.89 per share of $25 value against $4.85 on 400,000 shares in 1927.

NEW HAVEN—**Edwin P. Root,** with 54 years' service with the **New Haven Clock Company,** has resigned as president of the concern and was made chairman of the board of directors. **R. H. Whitehead** was advanced from the office of vice-president to president.

—W. R. B.

Middle Atlantic States

Newark, N. J.

April 1, 1929.

The **Northern Manufacturing Company,** manufacturers of radio bulbs and equipment, has purchased the plot of land at 377 Ogden Street and will erect an addition to its plant. The company has increased its business of late and now needs additional factory space. **The Schultz Manufacturing Company,** manufacturers of radio equipment, has purchased the property at 548-56 South Eleventh Street, and will occupy the building shortly. The property is two and a half stories high, containing 22,000 feet of floor space. It has an 118 foot front and depth of 130 feet.

Goerdes Metal Goods, Inc., has been chartered with $500,000 preferred stock and 500 shares common no par, to secure a plant and manufacture metal novelties. The incorporators are **Fred W. Goer,** Orange; **Henry J. Eberhardt and Charles L. Hedden,** Newark.

The **Sunlight Lamp Company,** manufacturers of radio tubes, has leased the plant at 76 Colt Street. The building is being equipped with modern automatic machinery and will have a capacity of 15,000 radio tubes per day. The company also has another factory on Springfield Avenue.

The **Manufacturers Can Company** of Harrison, N. J., has been sold to the **Continental Can Company** of Jersey City. The Manufacturers' establishment will carry on the business. The sale includes good will, machinery and other equipment in the Harrison plant, but not the buildings and grounds. These will remain in the hands of **Stephen F. Milligan,** principal owner and majority stockholder of the Manufacturers' Company.

The following Newark concerns have been chartered at Trenton: **New Jersey Auto Radiator Company,** manufacture auto radiators, $125,000. **Stacey Lane, Inc.,** manufacture welding machines, $100,000 preferred and 500 shares common. **New Jersey White Metals Company,** 10 shares no par, manufacture metals. **New Jersey Jewelry Manufacturing Company, Inc.,** $125,000, manufacture jewelry.

—C. A. L.

Trenton, N. J.

April 1, 1929.

The John A. Roebling Sons Company will play a part in the construction of the proposed seadrome to be built at Cape Hatteras and towed 300 miles out to sea as an intermediate landing field for New York to Bermuda airplanes. Plans for the floating airport, prepared by **Edward H. Armstrong,** have been approved by a commission of well known capitalists and a number of industrial organizations. **Henry J. Gielow, Inc.,** naval architects, have been retained as consulting engineers and the details of the hull construction, cables, chains, drums and anchors have been turned over to the Roebling company, the **Sun Shipbuilding Company** of Chester, Pa., and the **Lidger Wood Manufacturing Company.** When completed in July, 1930, the seadrome will have cost approximately $1,500,000 to build. It will be 1,200 feet long and 200 feet wide at the ends and 400 feet wide in the centre. A crew of forty-three men will live aboard the drome to operate the hotel, machine shops and speed boats.

The Victor Metalcraft Corporation will shortly locate in New Jersey and erect a factory for making and assembling airplanes. A landing field will also be equipped.

The United States Circuit Court of Appeals has affirmed the New Jersey Federal Court action in ordering the Internal Revenue Bureau to return excess income taxes of $3,975,061, collected on the 1917 income of the **American Can Company** and two of its subsidiaries, the **Detroit Can Company** and the **Missouri Can Company.** The Circuit Court upheld the ruling of Judge Bodine, of the District Court, that the government used the wrong basis upon which to calculate the net income of these companies. Of the refunds, $3,958,892 will go to the American Can Company, $12,033 to the Missouri company and $9,135 to the Detroit company.

The following concerns have been chartered at Trenton: **Hoope's Clocks, Inc.,** Elizabeth, $100,000, manufacture clocks; **Duoflex Piston Ring Sales Company,** Jersey City, $125,000, manufacture piston rings. **Pavonia Scrap Iron and Metal Company,** Jersey City, $50,000, scrap metals. **Soxon Radio Tube Company,** Paterson, 2,500 shares common, manufacture radio tubes.

—C. A. L.

Middle Western States

Detroit, Mich.

April 1, 1929.

The Detroit Plating Industries is the new corporate name of the organization and plants which have hitherto been known as the **Wise Industries, Inc.** The change, however, is only in name and not in personnel. **R. E. Baus** has been president and chairman of the board of directors of this organization since its inception in 1916. **Henry A. Molt,** vice-president and sales manager, has been connected with the company since March, 1921. **C. S. Slack,** secretary and treasurer, has been general manager since September, 1927. **Paul H. Henning,** engineer, joined the organization, November 1, 1928. The company numbers among its patrons all of the automobile and a large percentage of the accessory manufacturers not only of Detroit but also of Cleveland, Toledo and vicinities.

The General Chromium Corporation, doing chrome and Udylite rust proof plating, at Detroit, recently increased its facilities by a new installation at a cost of more than $30,000. It is now able to plate articles from the size of a pin up to and including pipe, tubing, and shafting 24 inches long. It also has facilities for plating sheets up to four feet wide and 18 inches long. The polishing and plating equipment in this plant now represents an investment of several hundred thousand dollars.

Aircraft Development Corporation, which is building an all-metal airship for the United States Navy at its Grosse Ile hangar, near Detroit, announces that the ship will be given its first trial flight about April 15. The ship must have 30 hours of trial flight before it is ready for delivery.

Workers in the plant of the **Lincoln Motor Car Company** have learned that gloved hands are more sensitive to small indentations and bumps than the bare fingers. After the aluminum sheets for the body have been made they are examined carefully by gloved workmen for any uneven surfaces too slight for the eye to detect. A high type of hand workmanship goes into the shaping of the aluminum sheets.

Bernard H. Liskow, factory superintendent at the Saginaw grey iron foundry of the **Chevrolet Motor Company,** has been elected president of the **Saginaw Engineers' Club.**

The Metallurgical and Chemical Corporation, 1633 Dime Bank Building, Detroit, was recently incorporated for manufacture and the sale of metallurgical products and chemicals. The stockholders are **John A. Baumgardner, George O. Hansen and Frederick R. Bolton.**

Chrome nickel alloy iron cylinder blocks, said to possess seven times the endurance of close-grained iron, has been used for the new Gold Crown engine introduced with Reo speedwagons, according to a factory statement. Valve grinding, valve seat wear and valve tappet adjustment are reduced by the use of this chrome nickel alloy, it is claimed.

The Keeler Brass Company at Grand Rapids, Mich., recently changed its capital stock from 80,000 shares to 85,000 shares.

D. W. Rodger, director of sales for the **Federal Mogul Corporation** at Detroit, announces the establishment of a die-casting division as a step in the corporation's expansion program. Recent development of fully automatic die-casting machinery installed by Federal Mogul, it is believed, will result in great manufacturing economy. Long familiarity with the metallurgical problems involved plus the fitness of a great deal of its furnace equipment, enable this manufacturer to start out most promisingly in this field, it is claimed. Mr. Rodger advises that die-castings will be offered in a full range of zinc, aluminum and tin base alloy. The die-casting division eventually will be housed in the 25,000 square foot addition that is being made to plant number one in Detroit.

The Stone Enameling Company of Detroit recently increased its capital stock from $50,000 to $150,000. The additional capital is to be used for expansion purposes, it is understood.

The new Model A Ford car uses five pounds more copper than the old Model T, it is stated, this being an increase of 20 per cent. Since Ford cars represented 47 per cent of all registered passenger cars in the United States at the time the model was changed, a substantial increase in the future automotive consumption of copper may be expected, it is presumed.

The Eureka Vacuum Cleaner Company expects shortly to reach a production figure of 1,000 machines daily, according to **Fred Wardell,** president, who also declares 1929 will be the best year in the company's history. "Our competitive position will be greatly improved," he says, "by the new popular-priced model which will be added to our line."

A proposed consolidation of the **Parker Rust-Proof Company** and the **Wolverine Enameling Company,** both of Detroit, will be acted upon at a special meeting of stockholders of the Parker company to be held at their plant on Milwaukee Avenue April 10. A meeting of the Wolverine stockholders is called for the same date. It is understood that a sufficient number of stockholders of each company have agreed to the consolidation.

The Hutto Engineering Company has received orders from four of the largest railroads in the country for its grinding equipment as a result of placing on the market this year a special grinder adapted to grinding 16-inch piston valves, bronze bearings, air brakes, etc. The Hutto grinding process is used by all of the large motor car companies.

The Hudson Motor Car Company is said to be one of the largest consumers of aluminum in the motor car industry. Wherever this metal can be used to advantage it is adopted. The lightness and strength of the metal are the reasons for this.

A gain of 20 per cent in sales for the quarter ending March 31 is announced for the **Bohn Aluminum and Brass Corporation.** All plants are being operated at record production, some departments being on a day and night production basis.

The general contract for a warehouse building to be erected on Livernois Avenue, Detroit, for the **Detroit Lead Pipe Works** has recently been awarded to the Austin Company.

D. J. Campbell has been reelected president of the **Campbell, Wyant and Cannon Foundry Company** at Muskegon. Other officers are vice-president, **George W. Cannon;** secretary-treasurer, **Ira A. Wyant;** assistant secretary-treasurer, **George D. Branson.** —F. J. H.

Toledo, Ohio

April 1, 1929.

The non-ferrous metal and plating plants are increasing in activity as Spring progresses. Practically every line in this field seems to be steadily on the gain. Manufacturers of various kinds of implements are keeping their plating plants operating to capacity and it looks now as if the coming Summer would break many production records.

A great amount of non-ferrous metal production is for the motor car plants not only in Toledo but also in Detroit and Cleveland. Extreme activity just now is manifested in the accessory plants, where the demand is pressing. Surveys indicate that the Summer of 1929 will be a record breaker in motor car production.

All the Great Lakes cities, especially those engaged in the manufacture of motor cars and airplanes, have been busy most of the Winter. Prospects are that the Spring and Summer will make still better showings.

Notwithstanding the fact that manufacturing is so active, there is a considerable amount of excess labor. This is due to the influx into the lake cities from less favored sections. Nevertheless, there has been no cut in wages and there are no disputes of consequence.

John N. Willys, president of the **Willys-Overland Company,** who recently returned from the Pacific Coast, declares that never before in the history of his company has it faced such a healthy business condition as exists at the present time. "We are now employing 22,000 workers in our Toledo plant," he said, "which means a great daily output. We have made necessary plant expansions and now are concentrating on further expansion of our sales and distributing organizations." —F. J. H.

Cleveland, Ohio

April 1, 1929.

Cleveland plants, particularly those that manufacture brass, copper and aluminum products, have all operated extensively during March and are starting April with even brighter prospects. Plating plants also have been busy. The greatest activity, however, is noted in the motor car accessory field. These plants are exceedingly busy and sufficient advance orders are reported to keep them going, probably at capacity, for a number of months. In fact, industrial conditions in the non-ferrous metal field in Cleveland are decidely promising. Of course, the active motor car industry is largely responsible for this. All of the auto plants in the cities of the Great Lakes are rushing production. Large quantities of accessories are produced in Cleveland for Detroit and Toledo, to say nothing about the city's own requirements.

The airplane industry also is making itself prominent and the demand for non-ferrous requirements in this field is growing rapidly. The output during the Spring and coming Summer is expected to exceed that of any previous period.

—F. J. H.

Illinois Notes

April 1, 1929.

The American Metal Company has notified the New York Stock Exchange of a proposed increase in authorized common stock to 2,000,000 shares from 1,000,000.

The Midwest Metal Manufacturing Company has been incorporated in Chicago with a capital of $100,000. Signers of the articles are Joseph Vani, Joseph Dangelo, Rosco Muscato and James Vani.

The United States Metal Products Company has been incorporated in Chicago with a capital of $800,000. Signers of the articles are Russell L. Sisung, Edwin H. Thoresen and William E. Thoresen.

—A. P. N.

Wisconsin Notes

April 1, 1929.

Profits of the **National Enameling and Stamping Company,** Milwaukee, totaled $378,236 in 1928, according to a recent announcement. The figure is after depreciation and interest, but before Federal taxes. The National Enameling and Stamping Company, headed by A. J. Kieckhefer, Milwaukee, manufacturers of enamel, tin and sheet steel ware and othe products.

Fire which caused a slight explosion when a gas meter was burned off the wall, broke out in the basement of the **Allis Manufacturing Company,** brass works plant in Milwaukee. The loss was estimated at about $2,500.

George E. Fabry for the past 10 years buyer in the offices of the **Aluminum Goods Manufacturing Company,** Manitowoc, Wis., has resigned his position and is now connected with the **Pilot Ray Corporation** of Los Angeles.

Leo B. Levenick has accepted a position in the sales department of the **Aluminum Goods Manfacturing Company,** Manitowoc, Wis. **George Vits,** national Republican committeeman, is president of the company. Mr. Vits was one of the party of Wisconsin delegates who represented the state at the recent Hoover inaugural at Washington.

The Invincible Metal Furniture Company of Manitowoc, Wis., has increased its capitalization to $350,000, represented in 14,000 shares with a par value of $25. Ten thousand of the shares are to be common stock while the remaining 400 will be seven percent preferred shares. **John Schuette** is president of the company and **I. M. Staufacher** secretary. —A. P. N.

Other Countries

Birmingham, England

March 25, 1929.

Values have further appreciated in the copper market and marked advances have been made in brass and copper products. These circumstances have a depressing effect among the Birmingham metal rollers. In the brassfoundry section many of the works are able to make full time and a hopeful view is taken. Compared with a year ago there is more work on the books. Competition is still keen from Germany in cheap cabinet brassfoundry.

E. R. Canning, chairman of **W. Canning and Company, Ltd.,** (whose works were recently described in these columns) referred to the development of chromium plating at the annual meeting of shareholders held recently. He described it as a useful section of the company's business. They had been able to put before their customers chromium equipment based on sound engineering and chemical lines. In addition to the business obtained from British motor car, motor cycle and cycle firms and many branches of the brass trade, the company has been able to secure good orders from motor car and other firms in France, Italy, Belgium and Spain. The directors have continued expenditure on scientific research. "We are told," said Mr. Canning, "that chemicals form the foundation of the world's industry, and we feel that money expended in the past on the research side of our business has been well spent."

The display of the **Birmingham Jewellers' Association** at the London section of the **British Industries Fair** has resulted in considerable business by a number of firms and a good deal of enquiry. **P. G. Beetlestone,** speaking at the annual meeting of the Association, reviewed the activities of 1928. During the year several branches of the trade had been pressing the Association to move in the matter of safeguarding of industries because of the effect of the competition of imported goods. A resolution had been passed expressing the view that the application of the safeguarding act to the jewelry, silver and allied trades would be of incalculable benefit. The Imitation Jewelry Bill, and with it the question of gold trade descriptions was still held up. Tests for rolled gold and gilt goods had been agreed upon. With regard to platinum, tests of foreign goods had been made with the view of ascertaining the quality, and experiments made to discover the most suitable alloy for manufacturing purposes. The matter was discussed at the international conference and at a later meeting in London by representatives of all manufacturers' associations, and the decisions reached would bring this country into line with the standard agreed upon by other countries at the international conference.

One of the branches which has made rapid progress during the last few years is that of enamelled silver. By reason of the attractive color in which mirrors brushes, cigarette boxes and photograph frames may be executed, these goods are exceedingly popular and command a good trade in Birmingham.

—J. A. H.

Business Items—Verified

Lasalco, Inc., 2828-38 LaSalle Street, St. Louis, Mo., manufacturers of the well known Richards plating barrels, have just awarded a contract for the construction of an addition to their factory, to be 60 by 120 feet in area. The additional floor space will be utilized for the manufacture of plating barrels, the demand for which has been exceeding former plant capacity, according to H. J. Richards, vice-president of the company.

The **Pangborn Corporation,** Hagerstown, Md., has taken over the goodwill, patterns, records and drawings of the **Universal Shot and Sand-Blast Manufacturing Company,** Hoboken, N. J. Universal parts and supplies will now be manufactured by the Pangborn Corporation, which produces a large line of sand-blast and dust collecting equipment and which will henceforth serve all users of Universal equipment as well as Pangborn products. **Robert H. Donnelly** and **Frank C. Weber,** former owners of the Universal company, are now connected with the Pangborn organization, according to the announcement by **A. M. Oliver.**

General Welder Company, 95 Steiner Avenue, Akron, Ohio, recently incorporated with $100,000 capital, has in operation a pattern department, brass, bronze, copper, aluminum and grey iron foundries and fully equipped machine shop. Company makes special welding machinery and plans

production of standard apparatus also. **B. T. Mottinger,** general manager, states that the company has most of its equipment and now needs only a few chain blocks, perhaps a crane, a blue printing machine, electric drills, electric grinding stand, some air chipping tools and various bench tools such as vises, etc. The company has orders on hand, including two for very large butt welding machines for pipe which will constitute the largest such machines ever built by an independent maker, according to Mr. Mottinger. They are being built on a twelve weeks' delivery schedule.

National Rivet and Manufacturing Company, foot of Park Place, Milwaukee, Wis., has been incorporated for the purpose of manufacturing brass, copper, aluminum and steel rivets of the solid, semi-tubular, tubular and split types used for brake-bands and facings for all classes of machinery, airplanes, etc. The new company absorbs the U. S. Rivet and Mfg. Company of Mishawaka, Ind. The officers are **P. H. Dorr,** president; **W. Fleming, Jr.,** secretary and treasurer. The latter states that the company is in the market at all times for brass, copper and aluminum wire, on which it invites quotations, and there is a possibility that shortly the firm will be in the market for additional drilling, splitting and heading machines.

Summit Brass and Bronze Company, Akron, Ohio, and the **Newton Foundry Company,** Barberton, Ohio, have consolidated under the name of **Summit-Newton Foundry Company,** with headquarters at 241 East State Street, Barberton, Ohio. The firm operates brass, bronze, aluminum, grey iron and semi-steel foundries and a pattern shop. **John Zamarik** is president.

Fillkwik Company, Attleboro, Mass., has purchased the business of the **Williams Company,** same city, and will consolidate operations at the Fillkwik plant in the Horton-Angell Building. The Fillkwik firm less than a year ago acquired the **Talbot Manufacturing Company** of Providence, R. I. All the firms are engaged in jewelry manufacture.

The Roessler and Hasslacher Chemical Company, manufacturers and importers of chemicals for electroplating and other purposes, have removed to new headquarters at 10 East 40th Street, New York City, where a new building has just been completed. The company states that the new location is convenient to the Grand Central, Baltimore and Ohio and Pennsylvania Stations, and to the Chemists Club, which is just around the corner.

Steam Specialty Sales Company, Charlotte, N. C., has been organized by **H. P. Ackerman,** eastern district sales manager for a number of large concerns manufacturing pipe and fittings, valves and allied products. The company carries large stocks of steam specialties at Charlotte.

Metal Stamping Corporation, West Bend, Wis., manufacturers of automotive specialties, has erected a new building with 40,000 square feet of floor space. The company is now in process of equipping its plant with facilities for nickel and chromium plating, according to **C. P. Davey,** general manager.

The J. C. Barrett Company, Hartford, Conn., manufacturers of wood and metal patterns, plans construction of a small factory on New Park Avenue, to be used making wood and metal patterns, in which the company has been engaged since 1904. There will be a department for casting aluminum match plates and pattern castings of aluminum and bronze. The company hopes to complete the new plant by October, 1929, according to **J. C. Barrett.**

The Roller-Smith Company, 233 Broadway, New York, announces some additions to its sales organization: **Jackson Brown, Jr.,** 701 Kittridge Building, Denver, Colo., is representing the Roller-Smith company in Colorado, Utah, Wyoming and Northern New Mexico; **The Manila Machinery & Supply Company, Inc.,** Manila, Philippine Islands, is representing the Roller-Smith company in the Philippines. Both of these new representatives will handle the Roller-Smith company's lines of electrical measuring instruments, relays and circuit breakers.

An electric type continuous porcelain enameling furnace is being installed in the plant of **The Buffalo Porcelain Enameling Corporation,** Buffalo, N. Y. The continuous enameling furnace is a comparatively new development in the enameling field, and so far there are less than twenty-five of them in operation.

Weaver Brothers Company of Clinton, Mich., manufacturers of factory equipment used in the chemical treatment of metals, has leased the main building of the Raymond Garage Equipment Company on Center Street, Adrian, Mich. The new company has already moved its machinery and stock and is in operation in its new location. The Weaver Brothers Company was organized four years ago as a subsidiary of the **Ferro Enamel Supply Company** of Cleveland. **R. A. Weaver** is president of both organizations and the subsidiary firm has been in charge of **J. C. Weaver.** For a considerable period the company had been handicapped for lack of room in which to make needed expansion and to add to the established products of the business. As a result, negotiations with the Adrian Chamber of Commerce were opened by Mr. Weaver and the lease to the Center Street factory property was signed.

The Brown Instrument Company announces the appointment of two vice-presidents as follows: **Charles H.** Kerr, vice-president and general manager; **George W. Keller,** vice-president and general sales manager.

The Armstrong Cork Company announces the consolidation of the offices of all its divisions at Lancaster, Pennsylvania, effective April 1, 1929. This involves the removal from Pittsburgh of the general office of the company and all executive offices of the Armstrong Cork Company, Cork Division, and of the **Armstrong Cork and Insulation Company,** with the exception of the purchasing department, which will remain in Pittsburgh. All communications hereafter should be directed to the new address.

The Scott Valve Manufacturing Company, Detroit, Michigan, recently reorganized, has increased facilities for the manufacture and distribution of Scott bronze, iron body and safety valves for steam, water, air and gas. **Alexander** P. **Gow,** who was connected with the old company for thirty-four years, serving as vice-president, is now president of the new company. **John A. Baas,** who was connected with the old company for thirty-seven years, is now vice-president. **A. DeLong Thomas,** secretary of the former company, still retains this position with the new company. **Guy C.** Powell, who was chief auditor, is now treasurer, and **Glen H.** Waid, who was formerly with the company for fifteen years, has been appointed sales manager.

Wahl Plating and Manufacturing Company, 35 South Street, Rochester, N. Y., recently sustained damages by fire at its plant. The company, which produces all types of metal finishes, lacquer finishes on metals, does silverware repair work, etc., continues in operation as previously.

Time-O-Stat Controls Company, Elkhart, Ind., plans construction of an addition to its plant. E. J. Leach, vice-president, states that the new building will cost $125,000 and that plans and specifications have already been prepared. The company operates a brass machine shop, tool, spinning, stamping, plating, polishing, lacquering and japanning departments.

Anchor Cap Corporation, 22 Queens Street, Long Island City, N. Y., manufacturing metal caps for bottles and capping machines, plans early removal of the recently acquired plant of the **American Metal Cap Company,** Brooklyn, to its main unit, **Anchor Cap and Closure Corporation,** Long Island City, where production is to be consolidated in an enlarged plant. No new equipment will be needed, it is stated.

American Electro Metal Corporation has signed a contract with the Lewiston Chamber of Commerce, Lewiston, Maine, under which the company will erect a plant there for manufacture of electrical appliances. The company was represented by **Dr. Ing. Paul Schwartzkopf** of Reutte Tyrol, Austria, and Amsterdam, Holland, who is president of the concern. The plant will cost between $125,000 and $150,000. Construction is to start at once.

The J. B. Ripley Brass Foundry, Inc., Windsor, Vermont, has started pouring concrete for the foundation of a new foundry for which four acres were recently acquired adjacent to the Central Vermont Railroad tracks. **J. B. Ripley,** manager, states that steel for the building and all equipment has been purchased, including an 8-ton capacity furnace, core oven, motors, compressor, sand blast, grinders, monorail and crane. The company casts brass, bronze and aluminum.

The Goehringer Foundry Supply Company, 919 West 5th Street, Cincinnati, Ohio, has started operation. The company manufactures foundry supplies, facings, etc. **E. J. Goehringer** is president and **William F. Hunsche,** secretary-treasurer.

Review of the Wrought Metal Business

By J. J. WHITEHEAD
President, Whitehead Metal Products Company of New York, Inc.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

April 1, 1929.

During the month of March price of copper and fabricated copper products were further advanced to new high levels. The market is firm and steady and sheet, strip and other products are passing to consumers rapidly. It is believed that manufacturers of copper sheet, tube, wire, etc., as well as fabricators of brass products are well sold ahead and that the tonnage of unfilled orders on the books of the companies supplying such materials are greater than ever before. In the case of certain sizes of fine wire it is understood that the mills are sold ahead well into next year. It is difficult to obtain prompt deliveries unless one's needs have been taken care of well in advance. Copper producers are sold well into August. European demand for copper has been about normal and it is believed that Europe is way underbought as far as her requirements for copper is concerned. After the tremendous business in copper during the past month a slight lull should be looked for. Certainly nothing in the situation at the present time indicates any great decline. Any slight recession, in my opinion, will be only temporary in character with possibly new high price levels later on, or very early in April. The demand for copper is unabated and will continue so until copper companies can produce sufficient metal to meet all demands. The per capita consumption of copper in the United States is in the neighborhood of seventeen pounds per person as compared to a per capita consumption of seven or eight pounds a few years ago. More copper sheet is being used than ever before and it is significant that during the past few months the demand for copper sheet and strip has shown a steady increase. Brass pipe for plumbing has made a new high mark of 77,600,000 pounds for 1928. It can be said that copper, brass, bronze, and other copper alloys are being used by house owners, architects, builders and others in an ever increasing quantity.

The use of nickel and monel is increasing. These metals have certain properties that recommend them for many purposes. Once used they will be found economical, and will materially reduce sales resistance.

The entire industry is highly prosperous and unless some major business reversal takes place there is every reason to be confident that the situation will continue highly satisfactory not only during the coming month but also during the rest of the year.

Looking further ahead it is felt that we are just entering an electrical age and this means an ever increasing consumption of copper. Extension by radio and cable companies already outlined will require tremendous tonnages of metal. Electrification of railroads now planned will consume additional large tonnages and that is indicative of what may be expected all along the line.

The copper industry at the present moment is facing an astonishing period of prosperity and reports of companies producing, manufacturing, distributing and otherwise connected with the industry will reflect this fact in due course.

Metal Market Review

By R. J. HOUSTON
D. Houston and Company, Metal Brokers, New York

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

COPPER

April 1, 1929.

Exceedingly strong conditions have prevailed in copper lately, and soaring prices have resulted from unprecedented activity in every department of the metal industry. Higher quotations were the inevitable outcome of recent developments, but the radical changes in the price structure of the market has only intensified demand.

Pressure for supplies has been in constant evidence. The persistency of demand has achieved extraordinary proportions, and it is definitely based on actual consumptive requirements. These have been much in excess of refinery production. A tremendous outlet furnishes the real basis for the present phenomenal developments.

Trade expansion and industrial growth have reached the greatest dimensions in history, and these factors are the impelling force behind the present remarkable copper situation. The upward price movement started more than a year ago. At the beginning of 1928 the market was at the 14 cent level and it has been gaining momentum rapidly since then. During the last 30 days the price has advanced from 19¾ cents to 24 cents a pound delivered to Connecticut Valley points. New demand for domestic and export account was both urgent and heavy in March. Sales were made as far ahead as July, and even that distant position might be rather difficult to secure owing to a closely sold out condition. Brass and copper mills are operating at a high rate. Manufacturing requirements are enormous and metal bought is for actual consumption. The present selling price represents an advance of 10 cents a pound since the first quarter of 1928, and more than half of that rise has taken place within the last 60 days.

It is obviously unwise, therefore, to take a cynical or chronically bearish attitude on the outlook for copper. Present progress and civilization demands more of the red metal than at any time in history, and under the spur of a natural evolution of gigantic proportions the immediate prospect for a growing demand is the brightest on record. Electrolytic for domestic delivery at close of month was 24 cents. European orders were taken at 24⅜ cents c.i.f. usual foreign ports. A rush of buying orders is probable early in April.

ZINC

The zinc market is considerably firmer than it was a few weeks ago, and after a long period of static conditions this market has joined the upward trend along with copper and lead. Recent buying was on a good scale. More orders were placed in the last half of March than for sometime previously. The advancing tendency of prices was regarded as tangible evidence of a better feeling for the future of the market. A large tonnage was purchased by consumers before the advance went into effect. Higher prices for ore helped to tone up the market for slab zinc, the new price for ore being $42.50 per ton against $41 a short time ago. The East St. Louis price for Prime Western is now 6.80c compared with 6.30c to 6.35c about the middle of March. The New York basis quotes 7.10c to 7.15c.

Stocks in smelters' hands decreased 4,798 tons in February.

TIN

The striking fact about tin is the comparatively tame conditions that have characterized the market for this commodity lately. In the past tin has been conspicuous for the most mercurial and erratic market movements. It was the speculative leader among the metal group at London and New York, and highly sensitive to manipulation by powerful operators. Price fluctuations covered a wide range, and were in keeping with the volatile quality of the values powerful interests succeeded in establishing each day. Apparently a decided change has taken place in regard to tin. The action of the market reveals a surprising degree of stability recently in strange contrast with former violent and rapid changes. Stabilizing influences have succeeded in keeping prices of Straits tin within a range of 48.37½c and 49.62½c during the month of March, a difference of 1¼c. It was not uncommon to see monthly variations of from 3c to 5c per pound. There has been a lack of former animation, and stabilization in tin would mean less opportunity for speculative movements. American tin deliveries in March amounted to 8,175 tons. Total deliveries for the first quarter of this year were 23,720 tons, against 19,165 tons in the first quarter of last year. Market closed quiet at 48.75c for Straits tin.

ALUMINUM

Conditions in the aluminum industry continue very active. Shipments to consumers are maintained in large volume, and the outlook is for heavier demands during coming months of the year. With the automobile producers operating at a high rate, aviation plants and cooking utensil factories specially busy, production and shipments of aluminum are running at an impressive rate. Imported material is also in greater consumptive demand than a year ago. Substantial quantities for prompt delivery have been taken indicating that stocks carried by consumers are in some cases relatively low. Exports of aluminum from Canada for the first two months of this year were 6,326,600 pounds, against 3,122,000 pounds for the first two months of last year.

ANTIMONY

In the early part of March the market for antimony was in a rather depressed condition, and Chinese regulus was quoted at 9⅛ cents, duty paid, for any delivery up to May. Some spot business was even reported at 9 cents. Buying interest developed at these levels, and prices soon firmed up to 9¼c to 9⅜c. Demand from consumers subsequently showed further improvement, and the market was carried up to the equivalent of 9⅞c duty paid. There is considerable stock afloat for this country and due in April. A slightly easier tone was noted at month end, with spot and future positions offered at 9¾c duty paid. Imports of antimony regulus into the United States in 1928 amounted to 22,697,593 pounds, as compared with 24,740,800 pounds in 1927.

LEAD

There was an active and strong market in lead during the past month, with rising prices and decided improvement in demand. Producers booked a large tonnage of business both for nearby and future shipments. Consumers showed a lively interest in market developments. London advanced sharply and the improvement abroad had the effect of increasing business with the local consumers. The disturbed conditions in Mexico also had some influence on the situation as the movement from that country was likely to be uncertain while the outbreak continues. There were three price advances in the market last month which lifted the selling level from 7.10c to 7.75c New York delivery as per quotations by the principal producing interest. There were reports, however, that outside parcels were 8c to 8¼c. The St. Louis basis is quoted at 7.65c to 8c for delivery in western territory. London behaved very erratically, with wide fluctuations and remarkably heavy sales for future deliveries.

QUICKSILVER

There was a fair amount of interest shown for this article. Demand, however, is confined to small quantities, but prices are fairly steady at $123 to $124 per flask.

PLATINUM

Refined platinum continues to quote $66.50 per ounce. No special developments are noted.

SILVER

China and India have been buyers of silver to a moderate extent. Offerings lately were rather reserved and readily taken for Far East account. The market has been remarkably steady for many weeks and closed at 56¼ cents per ounce. Silver stocks in Shanghai on March 21 totaled 162,200,000 taels, as reported to the Department of Commerce from its Shanghai office. Of this amount 74,000,000 taels were held in native banks. The previous figures were 159,000,000 taels and 71,000,000 taels respectively. Imports of silver into India for the two weeks ended March 16 amounted to 747,000 ounces, a large portion of which was from New York.

OLD METALS

A strong demand existed for all copper and brass grades due to the advancing prices for electrolytic copper. All this material met with ready sale, and consumers followed the upward tendency of the situation by making substantial purchases. Export demand was also quite a feature. Prime copper scrap sold up to 22¼ cents, but at the month end the tone eased up and holders were willing to make recessions from recent top prices. Lead and aluminum grades also strengthened, with an active demand. The market was rather unsettled at the close. Dealers buying prices were quoted at 21c to 21½c for crucible copper, 16c to 16½c for light copper, 12c to 12¾c for heavy brass, 10¼c to 10½c for light brass, 6c to 6¼c for heavy lead, and 17¾c to 18c for aluminum clippings.

Daily Metal Prices for the Month of March, 1929

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	4	5	6	7	8	11	12	13	14	15	18
Copper c/lb. Duty Free												
Lake (Delivered)	19.625	19.625	19.625	19.625	19.625	19.625	19.625	20.125	20.125	20.625	21.125	22.125
Electrolytic (f. a. s. N. Y.)	19.50	19.50	19.50	19.50	19.50	19.50	19.50	20.00	20.00	20.50	21.00	22.00
Casting (f. o. b. N. Y.)	19.25	19.25	19.25	19.25	19.25	19.25	19.25	19.75	19.75	20.25	20.75	21.75
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb.												
Prime Western	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35
Brass Special	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	48.80	48.875	48.80	48.625	48.55	48.875	48.75	48.375	48.50	48.70	48.875	49.625
Pig 99%	47.90	47.875	47.875	47.70	47.65	48.00	47.80	47.375	47.75	48.00	48.125	49.00
Lead (f. o. b. St. L.) c/lb. Duty 2⅛c/lb.	7.05	7.10	7.15	7.15	7.20	7.20	7.25	7.20	7.20	7.20	7.25	7.275
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	9.25	9.125	9.375	9.375	9.375	9.375	9.375	9.375	9.375	9.50	9.50	9.625
Silver c/oz. Troy Duty Free	56.25	56.50	56.25	56.375	56.375	56.375	56.25	56.375	56.375	56.375	56.375	56.25
Platinum $/oz. Troy Duty Free	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50	66.50

	19	20	21	22	25	26	27	28	*29	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Delivered)	22.125	23.125	23.125	24.125	24.125	24.125	24.125	24.125	....	24.125	19.625	21.525
Electrolytic (f. a. s. N. Y.)	22.00	23.	23.00	24.00	24.00	24.00	24.00	24.00	....	24.00	19.50	21.40
Casting (f. o. b. N. Y.)	21.75	22.75	22.75	23.75	23.75	23.75	23.75	23.75	....	23.75	19.25	21.15
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb												
Prime Western	6.35	6.60	6.60	6.60	6.60	6.80	6.80	6.80	....	6.80	6.35	6.468
Brass Special	6.45	6.70	6.70	6.70	6.70	6.90	6.90	6.90	....	6.90	6.45	6.568
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	49.50	49.00	49.25	49	48.70	48.70	48.50	48.75	....	49.625	48.375	48.853
Pig 99%	48.75	48.25	48.50	48.25	47.875	47.75	47.875	47.80	....	49.00	47.375	48.005
Lead (f. o. b. St. L.) c/lb. Duty 2⅛c/lb.	7.375	7.75	7.90	7.90	8.00	8.00	7.90	7.80	....	8.00	7.05	7.443
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	....	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	....	35	35	35
Shot	36	36	36	36	36	36	.36	36	....	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	....	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	9.75	9.70	9.75	9.875	9.875	9.875	9.75	9.75	....	9.875	9,125	9.548
Silver c/oz. Troy Duty Free	56.25	56.50	56.625	56.625	56.25	56.375	56.50	56.25	....	56.625	56.25	56.375
Platinum $/oz. Troy Duty Free	66.50	66.50	66.50	66.50	66.50	66.50	66 50	66.50	....	66.50	66.50	66.50

* Holiday.

Metal Prices, April 8, 1929

NEW METALS

Copper: Lake, 23.50. Electrolytic, 23.00. Casting, 23.00.
Zinc: Prime Western, 6.80. Brass Special, 6.90.
Tin: Straits, 48.15. Pig, 99%, 47.25.
Lead: 7.40. **Aluminum,** 24.30. **Antimony,** 9.625.

Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
Quicksilver: flask, 75 lbs., $123. **Bismuth,** $1.70.
Cadmium, 95. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 56.00.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $66.50.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	17¼to20
Brass Ingots, Red	21½to23
Bronze Ingots	22 to25
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	26 to42
Manganese Bronze Ingots	19 to21
Manganese Bronze Forging	34 to44
Manganese Copper, 30%	25 to35
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots	16½to19¾
Phosphor Bronze	22 to24
Phosphor Copper, guaranteed 15%	28 to30
Phosphor Copper, guaranteed 10%	27 to29
Phosphor Tin, no guarantee	60 to70
Silicon Copper, 10%, according to quantity	28 to32

OLD METALS

Buying Prices		Selling Prices
18½to19	Heavy Cut Copper	19½to20
17½to18	Copper Wire, mixed	18½to19
15 to15¾	Light Copper	16 to16¾
15 to15¾	Heavy Machine Composition	16 to16¾
11 to11¾	Heavy Brass	12 to12¾
9¼to 9½	Light Brass	10¼to10½
11¾to12	No. 1 Yellow Brass Turnings	12¾to13
14 to14½	No. 1 Composition Turnings	15 to15½
5¾to 6	Heavy Lead	6½to 6¾
3½to 3¾	Zinc Scrap	4¾to 5¼
8 to10	Scrap Aluminum Turnings	12½to14¼
13 to13½	Scrap Aluminum, cast alloyed	17½to18½
19 to20	Scrap Aluminum sheet (new)	22 to22½
30½to32	No. 1 Pewter	35 to38
20 to21	Old Nickel Anodes	**22 to23**
20 to23	Old Nickel	**22 to25**

Wrought Metals and Alloys

COPPER SHEET

Mill shipment (hot rolled) ....33¾c. to 34¾c. net base
From Stock ....34¾c. to 35¾c. net base

BARE COPPER WIRE

25⅞c. to 26c. net base, in carload lots.

COPPER SEAMLESS TUBING

35⅛c. to 36⅛c. net base.

SOLDERING COPPERS

300 lbs. and over in one order ....32⅝c. net base
100 lbs. to 200 lbs. in one order ....33⅝c. net base

ZINC SHEET

	Cents per lb.
Duty sheet, 15%	
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount	9.75 net base
Casks, jobbers' price	10.25 net base
Open casks, jobbers' price	10.75 to 11.25 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price, ton lots............33.30c.
Aluminum coils, 24 ga., base price, ton lots............31.00c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	58c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finshed Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 57¼c. to 59¼c. per ounce, Troy.

BRASS MATERIAL—MILL SHIPMENTS

In effect April 4, 1929
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.27⅛	$0.29¾	$0.31½
Wire	.27⅝	.30¼	.32
Rod	.24⅞	.30½	.32¼
Brazed tubing	.35⅛	....	.41¼
Open seam tubing	.35⅛	....	.39¼
Angles and channels	.35⅛	....	.39¼

BRASS SEAMLESS TUBING

34⅝c. to 35⅝c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	29¼c. net base
Muntz or Yellow Metal Sheathing (14"x48")	27¾c. net base
Muntz or Yellow Rectangular sheet, other Sheathing	28¾c. net base
Muntz or Yellow Metal Rod	25¾c. net base

Above are for 100 lbs. or more in one order

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	35¼c.	10% Quality	37¾c.
15% Quality	36¾c.	15% Quality	41c.
18% Quality	37¾c.	18% Quality	44¼c.

MONEL METAL, SHEET AND ROD

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs. 25c. over. Prices f. o. b. mill.

Supply Prices, April 8, 1929

ANODES

Copper: Cast .... } Quotations uncertain, due to rapid fluctuation of copper prices.
Rolled, oval ....
Rolled, sheets, trimmed....
Brass: Cast ....
Zinc: Cast .... 12½c. per lb.

Nickel: 90-92% .... 45c. per lb.
95-97% .... 47c. per lb.
99% .... 49c. per lb.

Silver: Rolled silver anodes .999 fine are quoted from 59¼c. to 61¼c., Troy ounce, depending upon quantity.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & Over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/68 Unbleached	$29.65
14" 20 ply 64/68 Unbleached	38.20
12" 20 ply 80/92 Unbleached	32.45
14" 20 ply 80/92 Unbleached	44.00
12" 20 ply 84/92 Unbleached	42.50
14" 20 ply 84/92 Unbleached	57.60
12" 20 ply 80/84 Unbleached	38.35
14" 20 ply 80/84 Unbleached	52.00
Sewed Pieced Buffs, per lb., bleached	40-73

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.14-.19
Acid—Boric (Boracic) Crystals	lb.	.08½
Chromic, 75 and 125 lb. drums	lb.	.20½-.21
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.17¼-21¾
Denatured, drums	gal.	.48-.56
Alum—Lump, Barrels	lb.	.03¼
Powdered, Barrels	lb.	.039
Aluminum sulphate, commercial tech	lb.	.02⅜
Aluminum chloride, solution in carboys	lb.	.06½
Ammonium—Sulphate, tech., bbls.	lb.	3.3
Sulhpocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.25
Chromic Sulphate	lb.	.37
Copper—Acetate (Verdigris)	lb.	.23
Carbonate, bbls.	lb.	.21½
Cyanide (100 lb. kegs)	lb.	.55
Sulphate, bbls.	lb.	7.7
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$70.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron Sulphate (Copperas), bbl.	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13¾
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate, dry bbls.	lb.	.35
Chloride, bbls.	lb.	.20
Salts, single, 300 lb. bbls.	lb.	.13
Salts, double, 425 lb. bbls.	lb.	.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09
Potassium Bichromate, casks (crystals)	lb.	.09½
Carbonate, 96-98%	lb.	.06¾-.07
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.05½
Silver Chloride, dry, 100 oz. lots	oz.	.45
Cyanide (fluctuating)	oz.	.54
Nitrate, 100 ounce lots	oz.	.30
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.18
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04½
Phosphate, tech., bbls.	lb.	.03½
Silicate (Water Glass), bbls.	lb.	.02
Sulpho Cyanide	lb.	.32½
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.38
Tripoli, Powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.50
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03¼